WATTLE RESEARCH INSTITUTE
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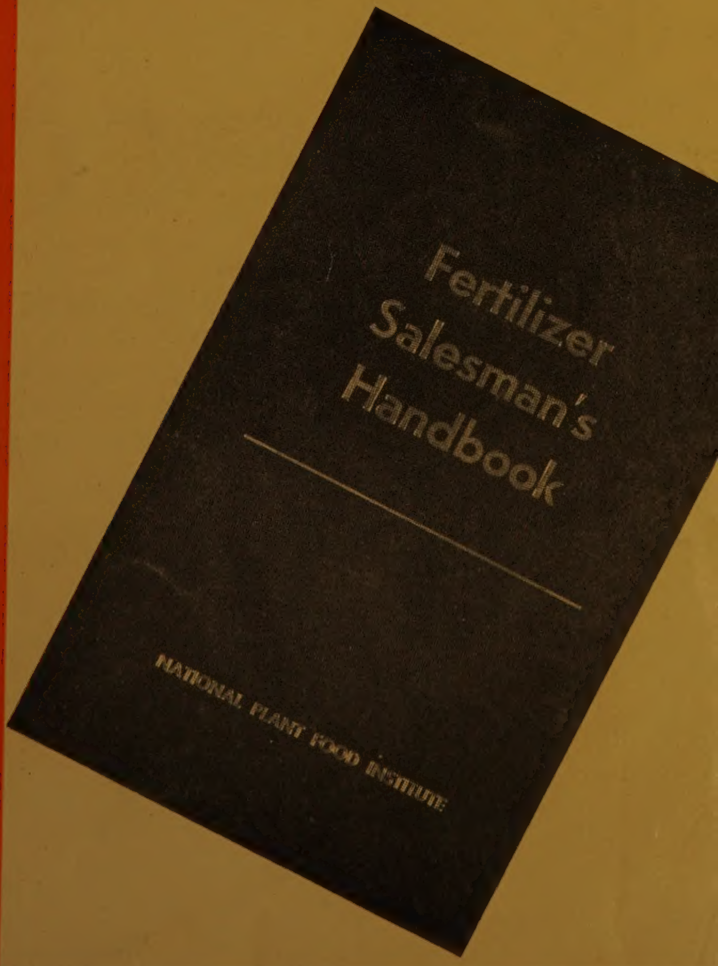
AGRICULTURAL *Chemicals*

IN THIS ISSUE:

- Using Organic Wastes
- Nematode Problem
- Fertilizer Consumption Report
- New Pesticides
- Experimental Fertilizer Unit
- Quarantine Treatments
- Silvicides for Forest Management
- Pacific NW Meeting Reports

FEBRUARY, 1959



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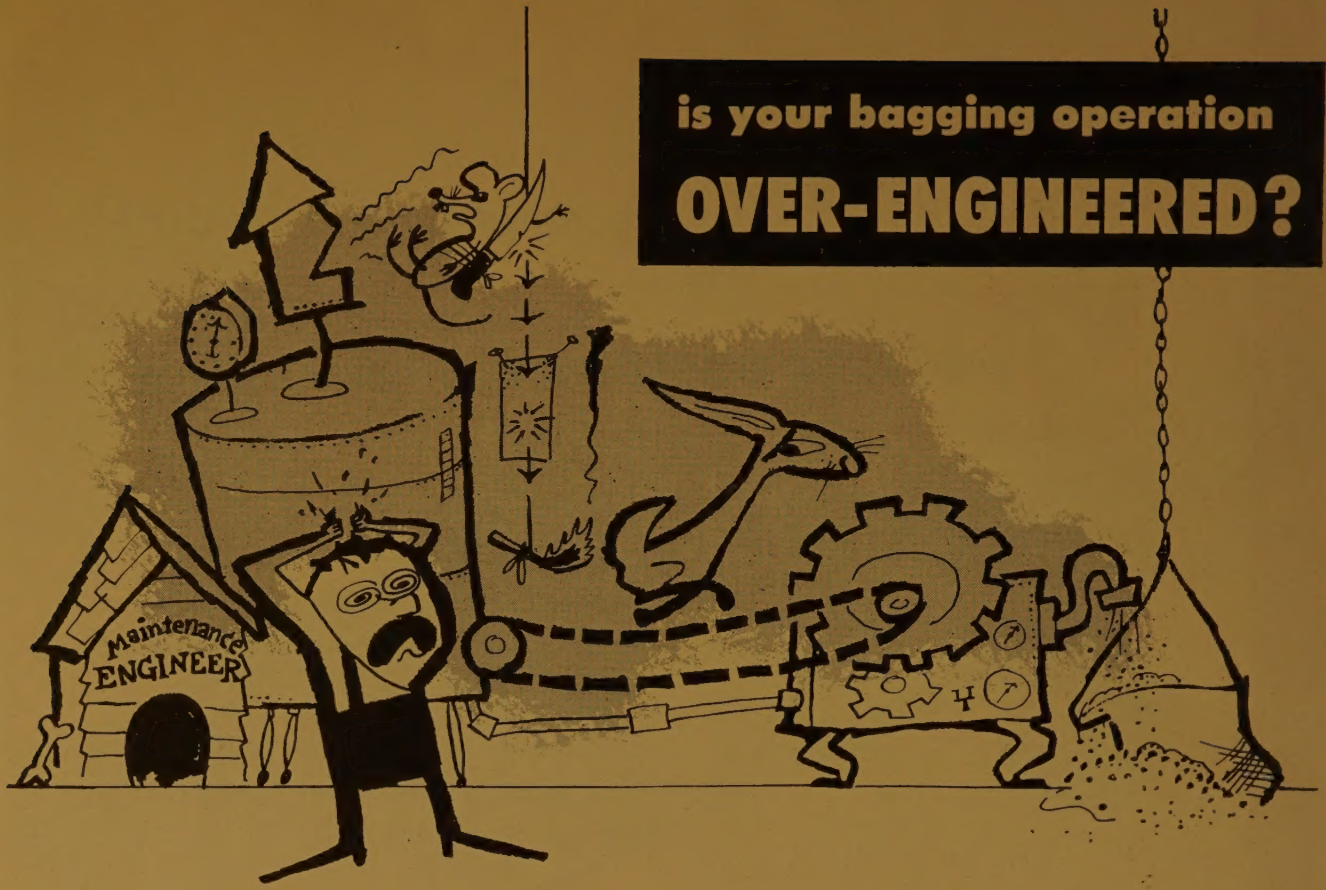

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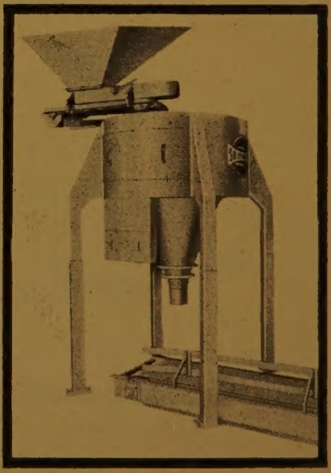

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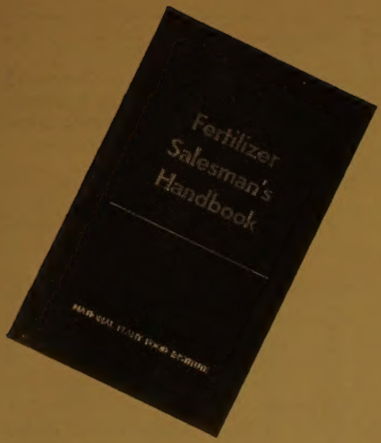
Vol. 14, No. 2 February, 1959

AGRICULTURAL Chemicals



This Month's Cover

220-page handbook for fertilizer salesmen just published by the National Plant Food Institute. See story on page 75.

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ARTICLES

AGRICULTURAL CHEMICALS INDUSTRY HOLDS THREE CONFERENCES IN OREGON, JANUARY 20-24 24

TREATMENTS TO PERMIT MOVEMENT OF AGRICULTURAL CHEMICALS UNDER PLANT QUARANTINE (Part 1) 27
By Henry H. Richardson and J. W. Balock

ECONOMIC POTENTIAL IN UTILIZATION OF ORGANIC WASTES 30
By M. S. Anderson

PRELIMINARY FERTILIZER CONSUMPTION REPORT FOR 1958 34
By Walter Scholl, M. M. Davis, A. W. Woodard, E. I. Cox

THE NEMATODE PROBLEM (Conclusion of a 2-part article) 36
By Joseph F. Spears

EXPERIMENTAL FERTILIZER PROCESSING UNIT AT GRACE 39

NEW COMMERCIAL AND EXPERIMENTAL PESTICIDES 40

NEW TRACTOR OPERATION FOR COOP 45

HORN FLY CONTROL WITH BAYER 21/199 53
By H. G. Alford and C. M. Jones

SILVICIDES FOR FOREST MANAGEMENT 60
By S. F. Potts

FEATURES

TRADE ASSOCIATION LISTING 6

IN THE SPOTLIGHT THIS MONTH 9

INDUSTRY CALENDAR 9

EDITORIAL 23

THE LISTENING POST 47
By Paul Miller

THE CUSTOM APPLICATOR 54

PEST ROUNDUP 65
By Kelvin Dorward

WASHINGTON REPORT 68
By Donald Lerch

FERTILIZER VIEWS AND NEWS 73
By Vincent Sauchelli

INDUSTRY NEWS 75

PROFESSIONAL DIRECTORY 129

CLASSIFIED ADVERTISING 129

ADVERTISER'S INDEX 131

TALE ENDS 132

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National Agricultural Chemicals Association, Association Building, 1145 19th St., N.W., Washington, D. C. Lea Hitchner, exec. sec.

National Plant Food Institute, 1700 K St., N. W., Washington, D. C. Paul Truitt and Russell Coleman, executive vice-presidents.

Regional Offices listed on page 121.

American Potash Institute, 1102 16th St., N.W., Washington 6, D. C. H. B. Mann, president.

American Society of Agronomy, 2702 Monroe St., Madison Wisc. L. G. Monthey, executive secretary.

American Phytopathological Society, S. E. .A. McCallan, secretary, Boyce Thompson Institute, Yonkers, N. Y.

American Chemical Society, 1155 16th St., N. W., Washington, D. C.

Association of Official Agricultural Chemists, P. O. Box 540, Benjamin Franklin Station, Washington, D. C., William Horwitz, secretary-treasurer.

Agricultural Ammonia Institute, Hotel Claridge, Room 305, Memphis, Tenn., Jack Criswell, executive vice president.

American Society of Agricultural Engineers, F. B. Lanham, secretary, 505 Pleasant St., St. Joseph, Mo.

Carolinas-Virginia Pesticide Formulators Association, 516 S. Salisbury St., Raleigh, N. C. Hugh Horn, secretary-treasurer.

California Fertilizer Association, Sidney Bierly, executive secretary, Suite 1, Boothe Building, 475 Huntington Dr., San Marine, Calif.

Chemical Specialties Manufacturers Association, 50 East 41st St., New York City, Dr. H. W. Hamilton, secretary.

Entomological Society of America, 1530 P. Street N. W., Washington D. C., R. H. Nelson, secretary.

National Fertilizer Solutions Association, 2217 Tribune Tower, Chicago, Ill. M. F. Collie, secretary.

National Cotton Council, PO Box 9905, Memphis, Tenn.

Soil Science Society of America, 2702 Monroe St., Madison, Wisc. L. G. Monthey, exec. sec.

Weed Society of America, W. C. Shaw, secretary, Field Crops Research Branch, Beltsville, Md.

Western Agricultural Chemicals Association, Charles Barnard, executive secretary, 2466 Kenwood Ave., San Jose, Calif.

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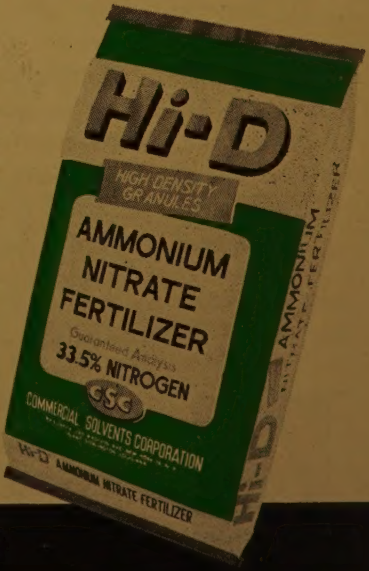
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MEETING CALENDAR

- Feb. 9-10 — National Cotton Council, 21st Annual Meeting, Dinkler Plaza Hotel, Atlanta, Ga.
- Feb. 10-12 — Texas Agricultural Chemicals Conference, Texas Tech College, Lubbock, Tex.
- Feb. 11-13—Pennsylvania Lime and Fertilizer Conference, Pennsylvania State University, Nittany Lion Inn, University Park, Pa.
- Feb. 12-13 — Midwestern Agronomists, Fertilizer Industry Representatives, 11th annual meeting, Edgewater Beach Hotel, Chicago.
- Feb. 13 — Winter meeting, Executive Committee of the Fertilizer Section, National Safety Council, Heart of Atlanta Motel, Atlanta, Ga.
- Feb. 13-14 — Mississippi Aerial Applicators Meeting, Mississippi Gulf Coast.
- Feb. 16-17 — Southwestern Branch, Entomological Society of America, 7th Annual Meeting, Adolphus Hotel, Memphis, Tenn.
- Feb. 13-18 — Maryland Agricultural Pesticides Conferences, at Salisbury State Teachers College, Feb. 13; La Plata, Feb. 16; and Frederick, Feb. 18.
- Feb. 18-20 — Midwest Shade Tree Conf., La Salle Hotel, Chicago.
- Feb. 22-24 — Texas Agricultural Aviation Conference, Texas A&M College, College Station, Texas.
- Feb. 24-25—Alabama Pest Control Conference, API campus, Auburn, Ala.
- Feb. 22-25 — Western Weed Control Conference, Cosmopolitan Hotel, Denver, Colo.
- Feb. 26-27—Utah State Weed Conference, Utah State Fairgrounds, Salt Lake City.
- Mar. 2-3 — Southern Safety Conference, Fertilizer Section, Asheville, N. C.
- Mar. 4-5 — Georgia Entomological Society, 23rd Meeting, Radium Springs Hotel, Albany, Ga.
- Mar. 4-5 — Nebraska Weed and Pest Control Meeting, Fonner Park, Grand Island, Nebr.
- Mar. 17 — Spring Meeting of Western Agricultural Chemicals Association, Hotel Miramar, Santa Barbara, Calif.
- Mar. 25-27 — North Central Branch, Entomological Society of America, 14th Annual Meeting, Neil House Hotel, Columbus, Ohio.
- June 9-10 — Seventeenth Annual Convention of the Association of Southern Feed and Fertilizer Control Officials, Velda Rose Motel, Hot Springs, Arkansas.
- June 14-17 — National Plant Food Institute, Annual Convention, Greenbrier Hotel, White Sulphur Springs, W. Va.

In the Spotlight this Month

- **Organic Fertilizers** . . . A practical review of the economic potential of organic wastes; — discussion of waste sources, treatment of waste for commercial use, and comment on chemical composition. Page 30.
- **Nematode Problem** . . . Conclusion of a two-part article on nematodes as a factor in crop production. This installment reports on the burrowing nematode, which is the cause of "spreading decline" in citrus; . . . the potato rot nematode—now under regulation; and tobacco cyst nematode. Page 36.
- **Fertilizer Consumption** . . . Although total fertilizer consumption for the year ended June 30, 1958 is down 1.5% from the preceding year, — consumption of primary plant nutrients registers a 1.4% gain (88,000 tons). Page 34.
- **Plant Quarantine Treatments** . . . A review of various quarantine treatments to permit movement of agricultural commodities. Methyl bromide is reported to be in greatest use; fumigation with ethylene dibromide is increasing; hydrocyanic acid still has some use on cotton bales; cold-storage treatment has extensive use — especially on deciduous fruits. Page 27.
- **Western Insect Threats** . . . Reappearance of the codling moth as the number one pest in western fruit orchards, — and identification of pear leaf blister mites were two developments attracting particular attention at the Western Cooperative Spray Project, late in January. Discussion of the serious outbreak of corn ear worms in Washington dominated the meeting of the vegetable insect conference. Page 24.
- **Pesticide School** . . . Highlights from North Carolina Pesticide School — Fungicides Maneb, Dyrene and Phaltan reported to control early blight and gray leaf spot; — Soil fumigation considered practical means of controlling sting nematode; New pesticide dusts effective on Mexican bean beetle are: Sevin, Rogor, Trithion and Diazinon. Page 91.

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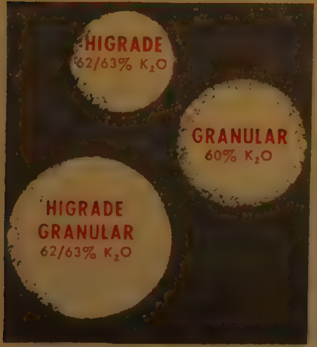

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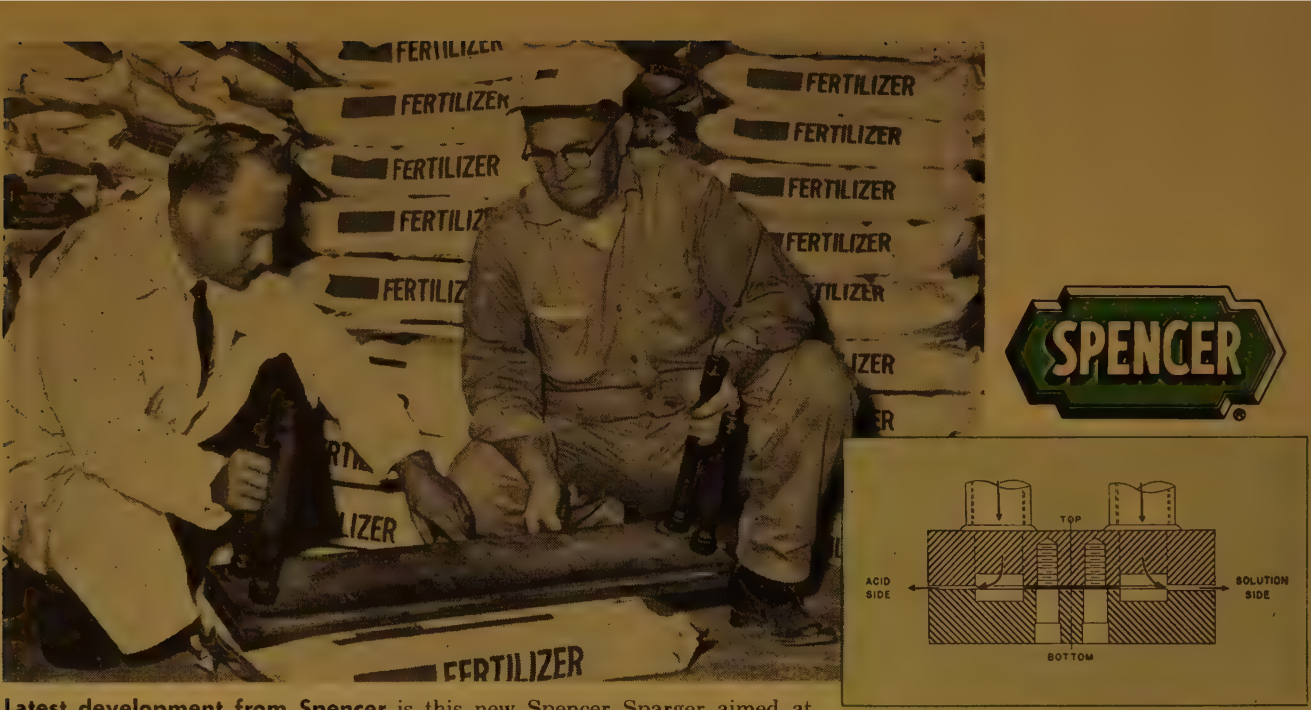

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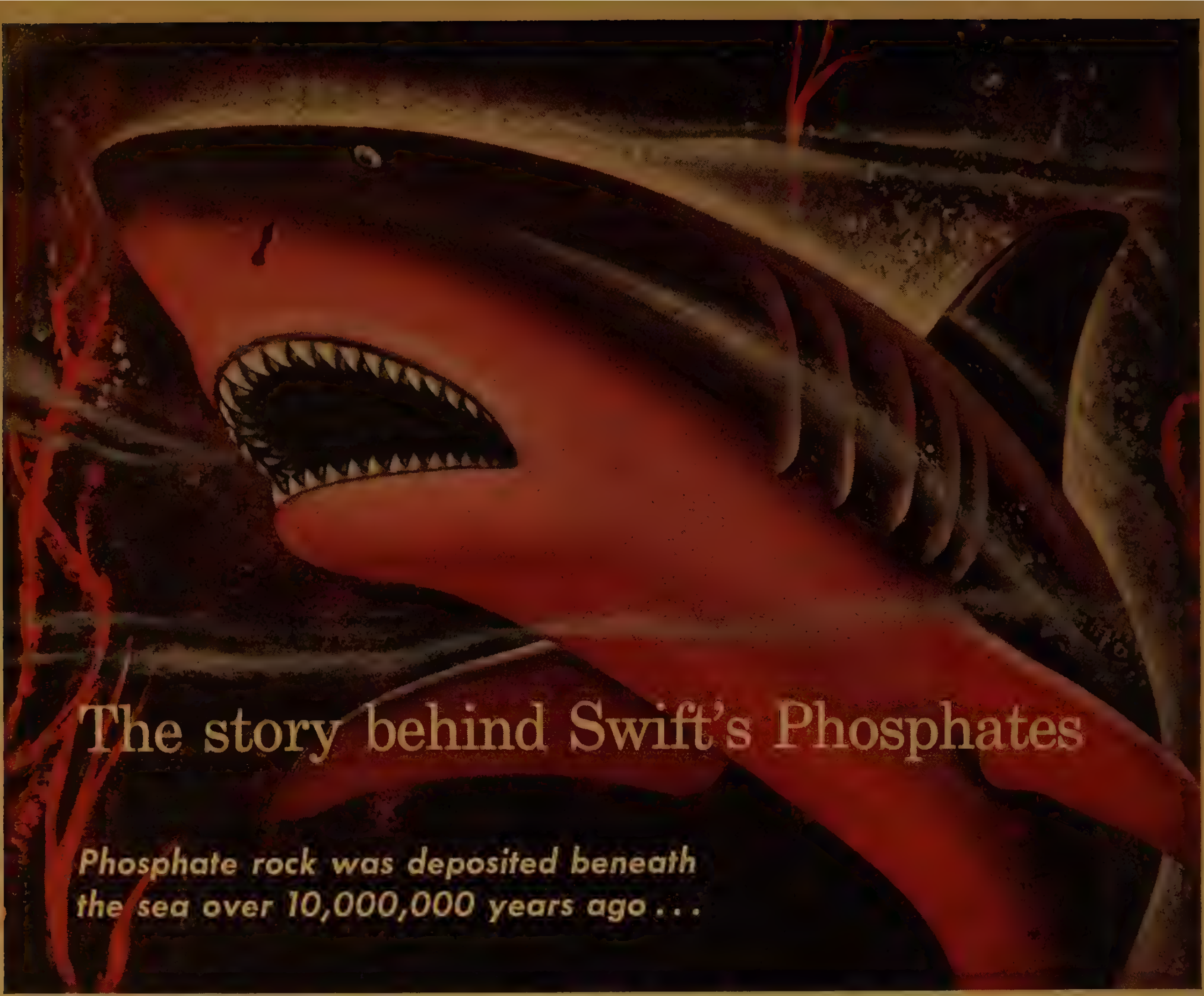
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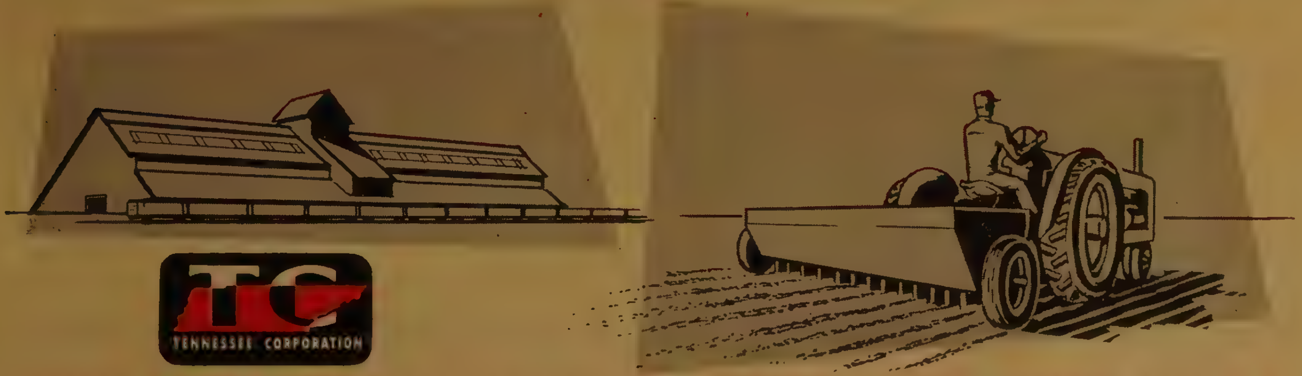

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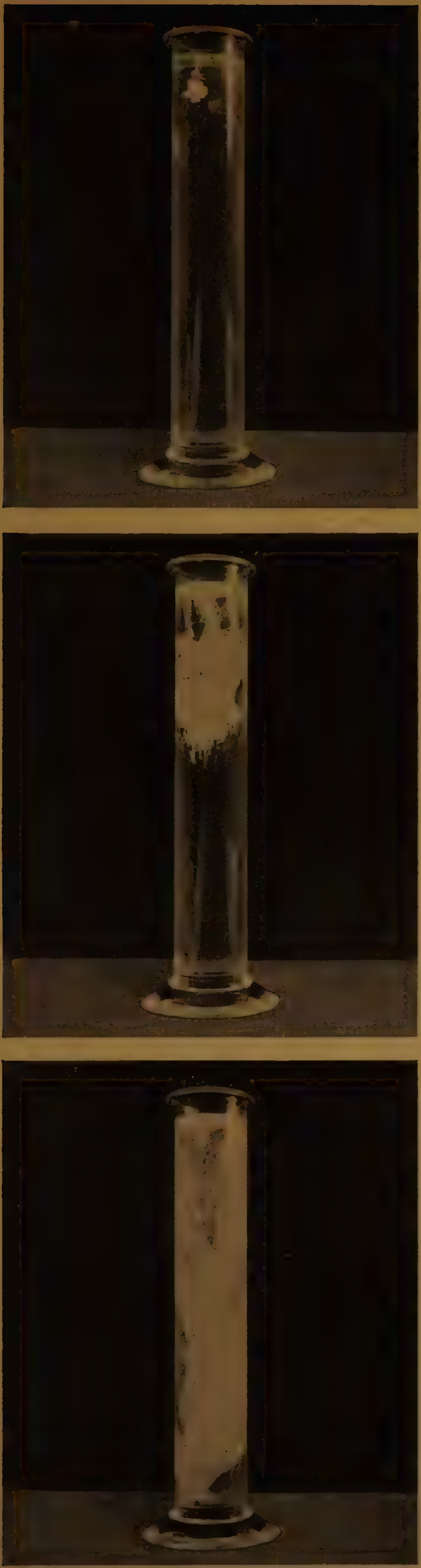

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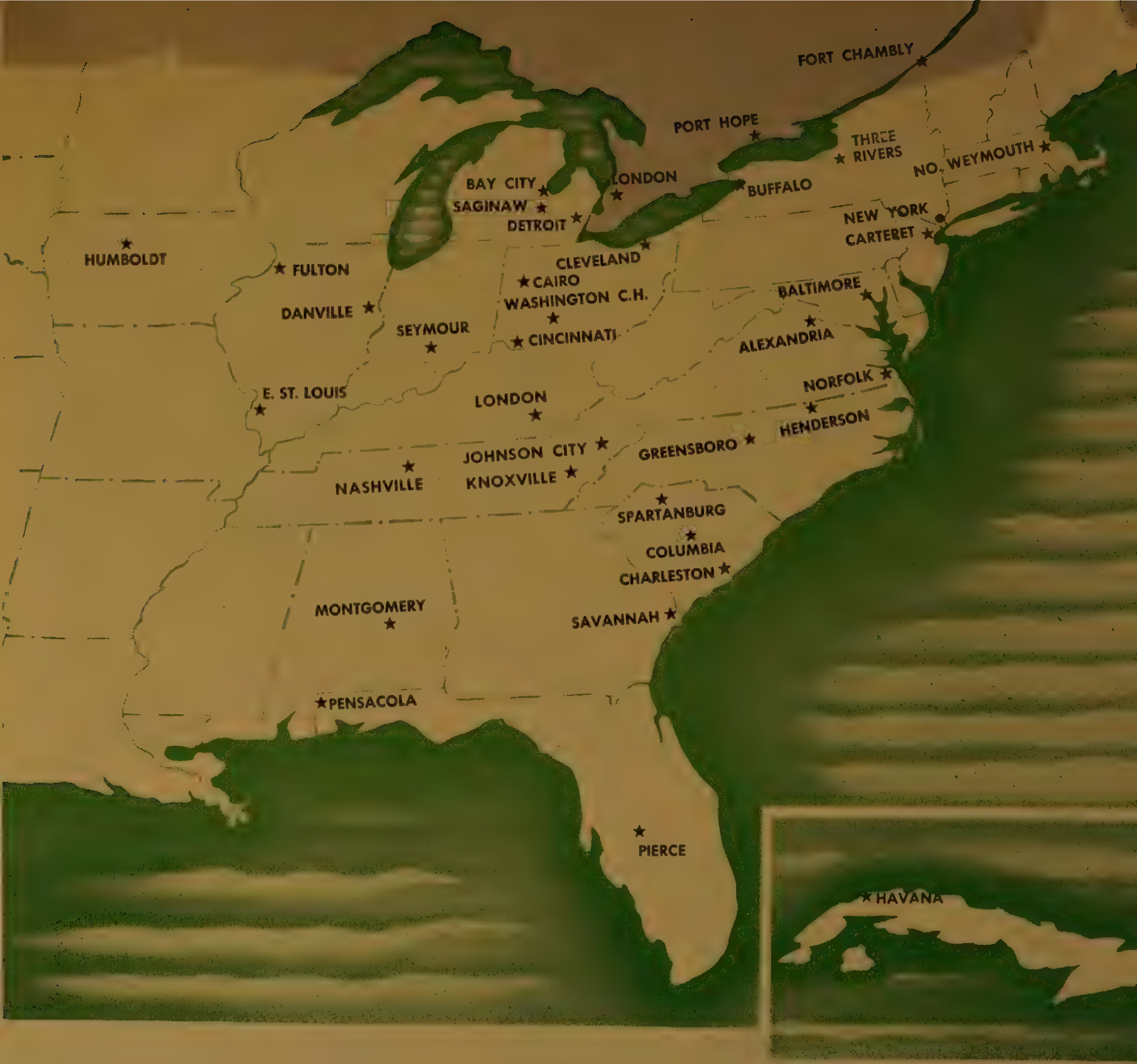

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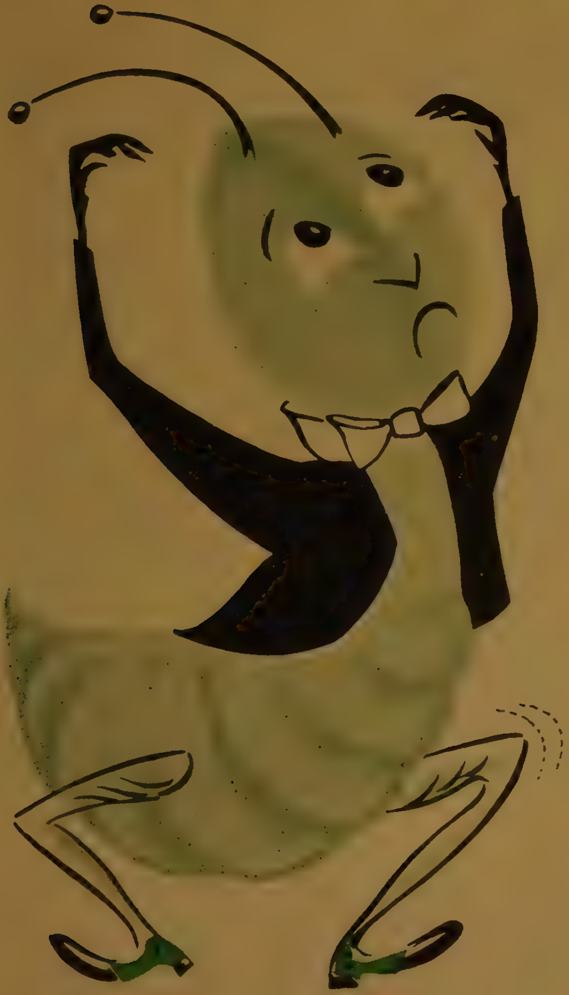

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EDITORIALS

THE variety and complexity of the modern-day pesticide arsenal never ceases to amaze us. Years ago it used to be enough to know how to deal with lead, arsenic and bordeaux mixture;—then a few botanicals such as pyrethrum and rotenone came along to confuse the issue. Today, however, with dozens of research laboratories spawning a host of conventional new insecticides, fungicides and herbicides at a furious rate,—to say nothing of antibiotics, plant growth regulators, biologicals, hormones, systemics, microbials, etc.,—it is as much as we can do just to keep track of the new products, and perhaps be able to identify them generally as to type and name of producer.

Feeling that our readers would welcome some assistance in keeping in touch with developments in new pesticides, we have been running in recent issues a continuing review of the growing number of new products. We hope to complete our study in another month, if the research laboratories don't cross us up by bringing out a dozen new products before we can close our next issue. Getting the facts on these new materials from the industry, incidentally, has been a major task, although a rewarding one.

We have a feeling that others even more expert in the pesticide field are having similar difficulties in keeping in touch with developments. At a recent meeting of the Commercial Chemical Development Association, called for the purpose of discussing and evaluating the role of this growing list of new pesticides, speakers mentioned a number of new products with which many experts in the industry seemed to be completely unfamiliar. Even when we were able to trace some of these materials back to the company responsible, often their general pesticide staff knew little about the new products.

The industry is certainly to be congratulated on the proficiency of its research teams. But, what, we wonder, does it profit the basic producer to come up with these dozens of new and unique products, if it is going to do so little about informing pesticide formulators, dealers, government advisors and users what they are, what they will do, and how they should be used?

(*Continued on Page* 127)

PRELIMINARY figures on fertilizer consumption for the year ended June 30, 1958, show that there was a minor drop in tonnage from the previous year, but an increase in the quantity of actual primary plant nutrients that found their way onto the nation's crops. And looking back over the past eight or ten years it becomes apparent that the trend toward use of higher and higher concentrate fertilizers continues.

For the most recent year, total consumption of fertilizer in the U. S. and Territories amounted to 22,358,000 tons. Oddly enough, this was just about what the bulk figure was six years earlier, for in the year ended June 30, 1952, the tonnage reported was 22,432,000 tons. There is a tremendous difference in the amount of plant food involved, however. In 1952 the total of all plant nutrients applied was 5,203,000 tons, as compared with 6,465,000 tons for 1958. The increase over the six year period is almost twenty-five per cent. This year, for the first time, the weighted average of primary plant nutrients in mixed fertilizers moved above the thirty per cent mark,—to a new high.

Thus, while on a tonnage basis the industry seems to have reached a plateau over the past few years, there is no reason to believe that consumption of actual plant food cannot continue to rise.

WESTERN COOPERATIVE SPRAY PROJECT — FIRST OF THREE INDUSTRY MEETINGS IN OREGON, WEEK OF JANUARY 20-24, 1959

TWO developments attracted particular attention at the 33rd annual Western Cooperative Spray Project conference in the Imperial hotel, Portland, Ore., Jan. 21 to 23. One was the announcement that Norton Wilson, USDA entomologist stationed at Riverside, Calif., had determined that there are two species of pear leaf blister mites attacking pears, which may account for variability in control tests.

Reappearance of the codling moth as the Number One pest in western fruit orchards was the other development. More time was given to consideration of control measures for codling moths than was devoted to any other insect pest, Dr. Martin Barnes, University of California Riverside station, reported at the open meeting which followed two days of sessions restricted to scientists.

Parathion added to DDT is still providing control where the pest's tolerance level is low, but even this combination is inadequate in some instances, he declared, particularly on a 20 to 25-day interval between covers.

Guthion has proved outstanding and will be of increasing utility as resistance to DDT increases, he forecast. Sevin also will be recommended in some areas as soon as a tolerance has been established. However, an acaricide must be added when this material is used.

Trithion has provided good control of codling moths in many areas, but Diazinon was not uniform in results produced, according to the speaker. Mild to severe injury to fruit followed use of Trithion in some instances, he added. Ethion, like Diazinon, was somewhat irregular in control.

Tedion failed to control apple rust mites, but otherwise was an excellent acaricide, he continued.

Pear psylla's resistance to organic phosphates still appears to be limited primarily to spots in Washington state, but because the pest travels widely, and also because of its ability to build up an apparent immunity, resistant strains are expected to appear in other pear-producing areas of the Pacific coast.

Control of the pear leaf blister mite depends in part at least, Dr. Barnes indicated, on early application of control sprays. None of the materials tested were effective after eggs had been laid, a time which varies with the seasons. Phostex provided good control when applied in early pre-bloom—delayed dormant or crack-bud.

Fall applications of Diazinon were effective, and the sodium salt of dinitrocresol applied at that time also worked well. The latter material was tested in British Columbia.

Experimental materials which show promise in control of green and rosy apple aphids include American Cyanamid's 18706 and 12880, as well as DiSyston. The various materials were not tested in all areas, and results in some instances are of only one year's work, Dr. Barnes emphasized.

Weather conditions upset plans of scientists as well as others, Louis G. Gentner, entomologist at the Oregon State college experiment station near Medford, indicated. Phostex applied Nov. 15 gave excellent control and clean-up. However, in 1957, sprays applied in mid-September were not so effective, because the mites, which normally migrate about that time, did not do so until Oct. 12. As a consequence there were "a certain number of infected terminals the following spring."

"A certain per cent of mites carry through," he explained. "Not too many in some cases, and a fair number in others."

The McDaniel mite which has built up a strain resistant to Kelthane also shows resistance to Aramite in this strain. Resistance is so great that it takes 32 times as much Kelthane to kill the hardy ones as it does to kill the non-resistant forms, it was explained to the industry men.

Cyprex has retained its favor with plant pathologists who have been experimenting with it in controlling some of the diseases attacking apples and pears, reported Dr. H. Ronald Cameron, Oregon State college. However, in British Columbia, when a surfactant was added, there was some foliage injury if the material was applied at the rate of five pounds per acre.

None of the newer fungicides was as good as Cyprex in Hood River, Ore., tests, it was reported, and there was no foliage or fruit injury on Golden Delicious, Yellow Newtowns, Delicious, Jonathan, Gravenstein, or Spitzenberg apples, or on Anjou pears in that area.

Outstanding control of apple and pear scab has been obtained during the past three years with Cyprex, Dr. Norman D. Dobie, Oregon State college, declared. The material has also shown promise in controlling peach leaf curl and brown rot blossom blight on peaches and cherries in limited tests.

American Cyanamid experimental materials 4 and 5 also look good in early trials on peach and cherry trees against brown rot blossom blight. Cyprex and Phaltan show promise in similar tests in controlling coryneum blight in Oregon.

Scientists have been working to discover chemo-therapeutants which are effective in controlling fungus and other diseases in the trees without harming the hosts. During the past year 46 materials were screened by one team, with some materials showing promise, both in killing the causal organisms and in leaving the trees apparently unharmed.

Cherry fruit fly continues to offer trouble to western orchardists, E. W. Anthon, entomologist at the Tree Fruit experiment station, Wenatchee, Wash., told the audience. Sevin gave excellent control in the field, but in the laboratory was a little slower in killing the pest than some other materials.

Diazinon was effective in British Columbia against the cherry fruit fly, with applications made close to harvest time.

San Jose scale was controlled with delayed dormant applications of Volck Supreme oil, either alone or in combination with Trithion, malathion, parathion, Diazinon and lime-sulfur, Anthon reported.

Lecanium scale was checked in British Columbia by Sevin at 8 pounds per acre in the pre-pink on apricots, and by malathion against the crawler stage.

- **Codling moth—No. 1 pest in western orchards**
- **Parathion, DDT, Guthion, Sevin—among pesticides recommended for the control of codling moth**
- **Cyprex—best of new fungicides on apples, pears**
- **Diazinon controls cherry fruit fly in B. C.**

Parathion and Diazinon were good in controlling mealy bugs in California when applied at petal fall. Anthon pointed out that honeydew excreted by the pests resulted in badly damaged fruit.

One of the first showings of "Health Hazards of Pesticides," a U. S. Public Health service movie filmed largely in Wenatchee, was made at the meeting, at the conclusion of a talk by Dr. William Durham from the PHS toxicological laboratory there. Dr. Durham renewed his plea for more care in handling highly toxic pesticides. In reply to a question from the floor concerning the recently-perfected urine test for presence of phosphorus, he commented that para nitrophenol and/or a chlorinated para nitrophenol was excreted.

Implication of the question was that the blood cholinesterase-level test would reveal possibilities of phosphorus poisoning that could not be detected with the urine test when some of the newer organic phosphate materials were used. The point was not entirely cleared up in Dr. Durham's reply, although he said that the urine test was more specific for parathion and EPN, among others, and so has limitations.

E. J. Newcomer, Yakima, one of the founders of the spray conference and a retired USDA entomologist, told the audience that foreign observers have expressed the belief that this country is spending too much in seeking chemical means of controlling pests and not enough on the possibilities of biological control.

Use of hormones, bacteria and other organisms as well as some radio-active materials as insect-killers are fields into which researchers are beginning to probe, Newcomer pointed out in his discussion of what the future offers.

Honey bees are not attracted by Dieldrin, Dr. Carl Johansen, Washington State college entomologist, who has been working on the problem of toxicity of various chemicals to bees, reported. Among other findings he has reported are:

1. Demeton, Thiodan, experimental material C-140, Nialate and Phosphamidon were relatively non-hazardous to honey bees in red clover plots.

2. Phosdrin, Thimet, Dibrom and Trithion caused high direct mortalities of honey bees, but retained only slight toxicity after 5 to 12 hours.

3. Sevin and Phostex continued to cause honey bee mortalities up to seven days after treatment, while the residual action of Guthion dropped off in two to four days.

Ralph Downing from the Canadian entomological laboratory, Summerland, B. C., took over as chairman of the conference to serve during 1959. F. E. Ellertson, Oregon State College entomologist stationed at the mid-Columbia branch experiment station, Hood River-The Dalles, was elected co-chairman. Anton S. Horn, Idaho state extension horticulture specialist, Boise, was re-elected secretary.

Hop Growers Suffer Losses From Corn Ear Worms

VEGETABLE insect pests keep shifting their line of attack just as do those infesting tree fruits, it was brought out at the 18th annual Pacific Northwest Vegetable Insect conference, held the two days preceding the spray conference in the same hotel in Portland.

For the first time, a really serious outbreak of corn ear worms in central and southern Washington caused severe losses in hops and other crops, according to Dr. Horace C. Telford, Pullman, chairman of the department of entomology at Washington State college. Last winter was mild, he pointed out, so many more than usual of the overwintering forms survived to cause damage during the summer.

When the moths were in flight, the pests were abundant in the city of Yakima, center of the hop-producing area in Washington. More than 30 times the usual number were caught in traps, it was reported. Because timing is critical in controlling corn ear worms, many growers were unsuccessful in their efforts.

Often there were half a dozen or more larvae per vine in the hop yards, and damage was extensive.

A sudden freeze this past November may have reduced the number of overwintering forms so that normal control measures will hold the pest in check, Dr. Telford added. No material superior to DDT has been discovered thus far.

Blanket applications of DDT in the Walla Walla area of southern Washington to control pests feeding on spinach had the beneficial effect of also holding down the onion maggot population in that portion of the state. Elsewhere it was a major pest, with entomologists from Idaho, Oregon, and British Columbia devoting much attention to means of combatting it.

There is still some disagreement among the scientists on the best methods, with control results quite variable. In Washington, Ethion, Guthion, Diazinon, Trithion and Co-Ral are more promising than others in most tests. However, one researcher added that American Cyanamid's 18133 and Co-Ral gave outstanding control.

Nothing much new has developed in symphylid control, with soil fumigants and parathion (not working every time) offering the best results so far.

Studies are being conducted on longevity of pesticides in the soil, with the work at Oregon State college now in its 10th year. Various pesticides which have been working into the soil to a depth of 7 to 8 inches in varying rates of application are tested against wireworms and tuber flea beetles. Test plots of DDT and the gamma isomer of BHC (both at 10 pounds per acre) were discontinued in 1956 because neither gave commercial control at

(*Continued on Page* 111)

Virus Problems Draw Largest Group Ever

A LESSER, but important wheel revolving in the complex which has developed within the spray conference is the Western Small Fruits Virus conference, which held its annual meeting simultaneously. With some 50 scientists—entomologists, plant pathologists, and horticulturists from state colleges, experiment stations and federal laboratories in the western part of the United States and Canada in attendance, it was the biggest gathering of the organization since it started six years ago.

Necrotic shock, a sudden browning of foliage on strawberry plants, followed either by death of the plants or an equally inexplicable disappearance of symptoms, was discussed by Dr. H. E. Thomas, head of the California Strawberry institute.

Three different investigations are under way in as many different parts of the West on heat treatment to cure virus ailments in plants. This was one of the main topics discussed during the meeting of the virus specialists.

Symptomatology—means of detecting the presence of virus—particularly in strawberry plants, also received much attention, as did virus vectors. Among the principal speakers were Dr. Robert Norton, of Utah—who was elected coordinator (chairman) for 1959, succeeding Dr. A. W. Helton, Moscow, University of Idaho plant pathologist and Mr. Wright from British Columbia.

The latter told of a recent trip to Scotland where he found problems facing growers and scientists very similar to those in the western part of the North American continent.

Dr. Norman D. Dobie, Oregon State college, was re-elected secretary of the Western Small Fruits Virus conference.

One of the topics much discussed outside the meeting rooms was the recently-revealed discovery of Dr. Peay (pronounced "pay"), a technique of apparently immunizing sugar beets to curly top. By mixing Thimet with an extract of juice from a curly top infected beet, then injecting a mixture into a healthy plant, immunity apparently has been achieved.

This is a discovery of tremendous importance, it was pointed out; the first break-through in the efforts chemically to combat virus ailments in plants. Leaf-hoppers, vectors of curly top virus, permitted to feed on diseased plants, were unable to infect "immunized" sugar beets.

Apparently the extract from the diseased beets carries an antigen, or something akin to that,

(*Continued on Page* 111)

Economics and Legislation Feature of NW Agricultural Chemicals Industry Conference Held January 21-22

INDUSTRY men gathered for the 6th annual Northwest Agricultural Chemicals Industry conference in the near-by Benson hotel Jan. 21 and 22. In spite of the conflict in dates with the California weed conference, attendance was the largest ever, according to C. O. Barnard, San Jose, Calif., executive secretary of the Western Agricultural Chemicals Association, which sponsors the convention.

"We have reached a point of understanding and development far in excess of what we anticipated in the beginning," he commented. "There is no reason why the Northwest conference should not continue to prosper and grow." Constantly improving programs bringing messages of importance to those in attendance explain the success of the gatherings, he added.

State and federal regulations concerning labeling and other phases of the agricultural chemicals industry were spelled out by D. W. Dean, San Francisco, USDA, who presented the federal portions; L. F. Semler, for Washington state, and J. D. Patterson for Oregon.

B. J. Smith, Portland, vice president for the western region, Chipman Chemical Company, talked on the proper channels for product distribution, while Harry Johnson, also of Portland, spoke

(*Continued on Page* 111)

Part 1 of a 2-part report

Treatments to Permit Movement of Agricultural Products Under Plant Quarantine

by Henry H. Richardson and J. U. Balock

Entomology Research Division,
Agr. Res. Serv., U. S. D. A.

PRIOR to the plant Quarantine Act of 1912, the U. S. Department of Agriculture had no control over the importation of plants and plant products or their movement from Hawaii, Puerto Rico, or the Virgin Islands to the mainland. Under authority provided by this legislation, plant quarantines, orders, and regulations have been promulgated to prevent the entry of injurious pests. Certain types of plants and plant products are denied entry, when it is not possible or practicable to eliminate pest risk associated with them; others may be approved for entry under permit upon compliance with conditions prescribed by the Department's Plant Quarantine Division.

In the early days of plant quarantine enforcement, few treatments were available to control undesirable pests and thus permit importation of affected plants and various agricultural commodities. At present, many of them are permitted entry subject to some type of treatment. These treatments include the use of chemicals, cold or heat. Irradiation is also showing some promise.

Some idea of the present volume of agricultural commodities treated in quarantine may be given in the following figures: For the year ending July 1, 1957, imported commodities treated mostly by fumigation included approximately 83,000 bales of bagging, 67,000 bales of broomcorn, 119,000 bales of cotton lint, linters and waste, 586,000 cases plus 64,000 additional pounds of fruit (mainly oranges, mangoes, and nectarines), 29,000 cases plus 494,000 additional pounds of vegetables (mostly garlic and okra), over 6 million plants, cuttings, and roots plus 54,000 containers and 98,000 additional pounds of seeds. In addition there were 204,000 cases of Hawaiian papayas treated by vapor heat. Also there were approximately 685,000 cases of Argentine and South African fruit given cold-storage treatment, mainly on ships in transit to the United States. In addition to the imported material, large amounts of agricultural commodities moving from State to State or out of various domestic quarantined areas were treated in accordance with State or other quarantine regulations.

Some of our own agricultural commodities are also being treated, mostly by fumigation, before export to meet quarantine regulations of other countries. Over recent years this has included fumigation of some apple, potato, and other shipments. The treatment of agricultural commodities for export appears to be increasing due to additional quarantine restrictions by other countries.

CHEMICAL TREATMENTS

Methyl Bromide Fumigation

FUMIGATION is the type of chemical treatment used most in quarantines. Methyl bromide is probably the most common fumigant. Its high efficiency for control of insects in stored products was first noted in France in 1932 by LeGoupil. Its possibilities in the control of insects due to its good plant tolerance were noted in California in 1935 by Mackie (1938), who brought it to the attention of North American workers. It was soon adopted rather widely. The list of workers helping to develop methyl bromide as a fumigant is very extensive. Reviews of the early literature have been given by Busbey (1944) and Steinweden (1945). Some review and studies of various factors have been reported by Richardson *et al.* (1943). Some of the many developmental studies on this fumigant have been reported by the following: Armitage and Steinweden (1946), Donohoe (1943), Easter (1940), English (1943), Gammon (1952), Hawkins (1939), Latta (1940,1941), Lindgren and Sinclair (1951), and Shepard *et al.* (1937) in the United States; Monro (1938) and coworkers in Canada; and Burns-Brown *et al.* (1955).

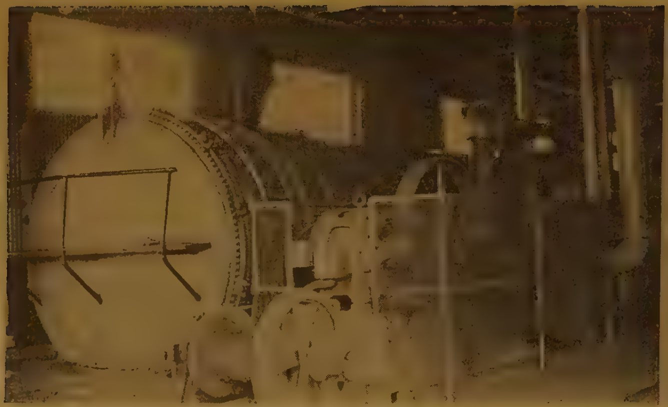

Figure 1—Cylindrical vacuum-fumigation chamber of approximately 4000 cubic foot capacity.

Figure 2—Loads of broomcorn on wheeled carts prepared for loading in vacuum-fumigation chamber.

Lubatti and Blackith (1950) and coworkers in England. Many others, both here and abroad, also made detailed investigations.

The main advantages of methyl bromide are its high toxicity to many insects, spider mites, and other pests in all stages of development, including the eggs; its generally good tolerance by many plants and commodities; and its stability and high penetrative ability. Methyl bromide (CH_3Br, bromomethane) is a gas at room temperature, its boiling point being about 4.5° C. It is shipped in heavy steel cylinders under pressure, or in 1-pound cans. The gas is relatively nonflammable; in fact, it has been used as a fire extinquisher. It is nearly odorless and about 3.3 times as heavy as air. Chloropicrin, or tear gas, has sometimes been mixed at a 2 per cent rate with methyl bromide to serve as a warning agent by means of its penetrating obnoxious odor. Methyl bromide is quite stable and little affected by commodities of high moisture content, such as living plants, fruits, or vegetables; in fact, high humidity seems to be generally desirable except in seed or grain fumigations. Like all fumigants, methyl bromide is toxic to man, and precautions must be observed in its use (Von Oettingen 1946).

The fumigation efficiency of methyl bromide depends on dosage, exposure period, and temperature. It increases at a fairly constant rate with the temperature, and within certain limits a 5-10° F. increase makes possible a decrease of about 1/2 hour of exposure or 1/2 pound of dosage (Division of Control Investigations (1943). An important advantage is its effectiveness under cool or rather cold conditions (50° down to near 32°). Most fumigations are made between 40° and 90°.

Methyl bromide may be used either at normal atmospheric pressure or under so-called vacuum fumigation at lower pressure. The use of vacuum makes possible a generally faster treatment or a smaller dosage, and usually aids in gas penetration of tighty packed commodities. Also, in vacuum fumigation the gas can be removed more quickly from the treated commodity by successive washes with fresh air, and then returned to commerce with less delay. This shorter time is very important where commodities are in transit. Vacuum-fumigation installations (commercial, Federal, State or locally owned) are available in most United States ports of entry (Figures 1-4). Since methyl bromide is much heavier than air, fan or blower circulation is required, even under vacuum fumigation.

Tests by the U. S. Public Health Service show that methyl bromide does not usually present a serious residue problem on foods (Dudley *et al.* (1940), and a large number of bromide tolerances for various fruits and vegetables have recently been approved by the U.S. Food and Drug Administration in accordance with Public Law 519 (Miller Amendment).

Methyl bromide is a basic treatment for imported nursery stock, including dormant plants, seeds, cuttings, roots, and flowers. For example, thousands of South African *Ornithogalum* (Chincherinchee) flowers are fumigated each year to prevent the entry of certain lepidopterous pests. It is estimated that nearly 95 per cent of the nursery stock and other plants being moved in commerce are tolerant to dosage schedules that will kill the insect and other pests involved. Of the remaining 5 per cent, some are on the borderline, but certain varieties of coleus, pelargoniums, azaleas and other plants are intolerant to methyl bromide. The standard dosage for dormant nursery stock or nonfoliated dormant plants, including bulbs, roots, and corms, is 3 pounds per 1000 cubic feet for a 2-hour exposure at atmospheric pressure and temperature near 70° F. Foliated dormant plants take 2½ pounds, and nondormant plants 2 pounds for the same exposure. Methyl bromide is used also under Federal quarantines, where needed for certain imported fruits and vegetables, including plums, grapes, nectarines, apples, peaches, pears, cipollini, garlic, horseradish, okra, pigeon peas, and chestnuts. It is used also on imported broomcorn and second-hand bagging for control of the durra stem borer, khapra beetle, and golden nematode cysts. Dosages vary with the pest and the commodity. Cantaloupes, eggplants, citrus, and a few other commodities will not tolerate methyl bromide at the dosages usually needed for the pest involved. Varietal differences, time of year, state of dormancy, and other factors may also be important.

Plant pests are sometimes intercepted on materials other than agricultural commodities or living plants. For example, the white garden snail, a severe plant pest, has been intercepted in the last two years on boxes of machinery and other equipment from the Mediterranean area. Recently entire ships carrying such material had to be fumigated with methyl bromide to control this or other snails.

Methyl bromide has also been used rather widely in the operation of domestic quarantines: on fruits and vegetables to permit movement from Japanese beetle quarantined areas, on Christmas trees from gypsy moth infested areas, on cottonseed from pink bollworm areas, on sweetpotatoes from sweetpotato weevil areas, and on seed and grain from khapra beetle areas.

Methyl bromide is also much used in State quarantines. For example, California requires methyl bromide fumigation of ear corn on account of the European corn borer quarantine, of citrus and other host plants on account of the citrus whitefly, of cucumbers and melons on account of the pickleworm and melonworm, and of walnuts and other nuts on account of the walnut husk fly. Fumigation of cotton-harvesting machinery previously used in other States where the pink bollworm or boll weevil might be present is also required. Arizona requires methyl bromide fumigation for citrus nursery stock on account of various scale insects, mites, and other pests. Strawberry plants must also be fumigated on account of the strawberry root weevil, ear corn on account of the European corn borer, grape vines and cuttings on account of grape phylloxera, roses, camellias and other plants on account of various scale insects. Other states and countries have similar requirements.

Methyl bromide appears to have little effectiveness against plant disease organisms when used at regular quarantine dosages.

Ethylene Dibromide Fumigation

IN recent years, ethylene dibromide (CH_2BrCH_2Br, 1,2-dibromoethane) has been found to be almost a specific against fruit flies. This chemical was developed as a fruit fly fumigant through the research of Balock, Lindgren, and others. Since fruit flies have been among the most important and troublesome quarantinable pests, ethylene dibromide fumigation has already found extensive practical use. The first application was against the highly destructive oriental fruit fly in Hawaii, where ethylene dibromide was found much more toxic than methyl bromide, the only fruit fly fumigant previously approved (Balock 1951, Balock and Lindgren 1951). The melon and Mediterranean fruit flies were also found very susceptible to ethylene dibromide. In practical use, a dosage of ½ pound of ethylene dibromide per 1000 cubic feet was usually specified, with an exposure period of two hours at 70° F., or above, under normal atmospheric pressure.

Since ethylene dibromide is of low volatility at room temperature (boils at 131° C.), an electric hot plate or similar device is used to vaporize the liquid inside the fumigation chamber. Both the liquid and the gas are nonflammable. Because the gas is more than six times as heavy as air, forced circulation is needed to distribute it. The gas has a characteristic odor which serves as a warning, but does not affect the taste of fruits fumigated at the usual dosage.

Ethylene dibromide has been applied successfully to Hawaiian

(*Continued on Page* 95)

Figure 3—Two large rectangular vacuum fumigation tanks operated by a State Port authority for fumigation of cotton, bagging and other types of commodities. The door slides to one side to open, as shown on right tank.

Figure 4—Nursery stock arranged for fumigation at USDA plant quarantine treatment plant. Gas analyzer at left is used to check on gas concentrations inside the chamber and to determine gas penetration into different types of commodities.

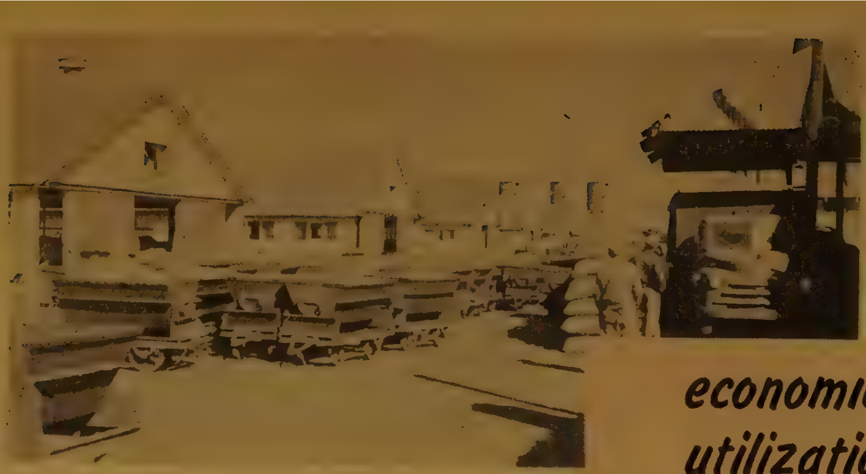

Figure 1—A large dairy in Jersey uses rotary drying equipment for processing cow manure. Superphosphate is added to fortify the P_2O_5 content, — cocoa shells are used as a conditioner in the drier.

economic potential in utilization of ORGANIC WASTES*

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IT is not necessary to argue the value of organic matter, and the discussion in this report deals with waste organic materials transported from place of origin to crop-producing land for soil improvement. The discussion here concerns farm manure, poultry manure, sewage materials, garbage, wood products, seedmeals, pomaces, and other miscellaneous materials available in the United States.

Farm Manure

Much has been written on the subject of farm manure (9,11, 12). Estimates of quantities produced and used in various ways are subject to assumptions of varying validity. A few statistics gathered from varied sources are given in Table 1.

Ordinary farm manure is not often sold in normal channels of trade. However, around the suburbs of cities, such material frequently brings a good price.

Dairy manure may be classed in a little different category from ordinary farm manure. Most material of this kind reported as sold is from dry-lot dairies of Western States, particularly California, where consumption for 1956 was 285,675 tons. The average sale price was 22 dollars per ton, dry basis. Total sales in the United States are estimated at 300,000 tons.

It has been estimated that about 1⅓ billion tons of animal manure with accompanying bedding are produced annually in the United States. The quality of such material is highly variable, and only a very small portion of the whole is actually sold in channels of trade. The fertilizer quality of different materials is shown in Table 2.

In the treatment and drying of dairy manure, cocoa waste, about 2 per cent nitrogen, is added as a conditioner, and superphosphate helps to hold the nitrogen during the heating process. The dry bagged material sells for $5.50 per 100 pounds delivered to homes in Eastern cities.

The operators of Union Stockyards in Baltimore, Md., find a ready market for their animal manure after composting on the premises. The price is about $3.50 per ton loaded on trucks. On the other hand, at the Omaha, Nebraska yards where large quantities are produced, about 10 per cent of production is distributed to farmers at a price covering only cost of loading. A small amount is processed and marketed in various ways, but nearly 90 per cent is transported in gondola cars to waste heaps.

At the East St. Louis Stockyards, large quantities of manure are heat-treated and packaged for sale to town gardeners over an ex-

Table 1. Annual production and utilization of farm and ranch manures in the U. S.

Kind of manure	Production or utilization (Tons)
Production of all animal manures*	1⅓ billion
Applied to crop land*	206 million
Sold**	300,000

*Damp condition, 60% water + some bedding
**Dry basis.

Table 2. Fertilizer grades of farm manure and quantities sold, dry basis.

	Grade	Annual consumption for soil improvement (Tons)
1—Stall manure with bedding	1.2-0.6-1.2	small
2—Droppings with some bedding	2-1-1	300,000
3—Dairy cow manure, fortified and dried	2-2-1	small

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*This paper was presented at the thirteenth annual meeting SCSA, Asheville, N. C., October 21st, 1958.

tensive area. Sheep manure is an important product there.

In the Corn Belt, farmers utilize manure as best they can, taking into account economic factors of labor, transportation, and cost of equipment. A few decades have brought about great changes in the conservation of farm manure. The old manure pile near a barn is seldom seen as one passes through Midwestern States. The old-type manure pile has given way to the use of a mechanical loader and immediate spreading.

Farmers will probably continue to utilize barnyard manure extensively for growing corn, and to a lesser extent for other crops—where crops and domestic animals are produced on the same farm. Transfer of weed seeds in animal manures is a problem of great importance. Composting in large heaps diminishes this hazard to such an extent, that in Iowa farmers are willing to haul away manure from old commercial piles without cost to themselves. In Eastern areas where soils are leached more extensively, farmers are willing to pay a modest price for such manure.

Composting operations employing expensive equipment have been installed at the Chicago Stockyards and at a few other Midwestern places of livestock concentration. While data are not available, the quantities of manure composted in this way are a very small part of the whole produced, and the prices asked are high on a plant-nutrient basis. Economic prospects for greatly expanded markets for manure composts appear not to be good. The product is desirable for farm and garden use, but prospective costs of the material to the user would seem to rule out extensive expansion of the business.

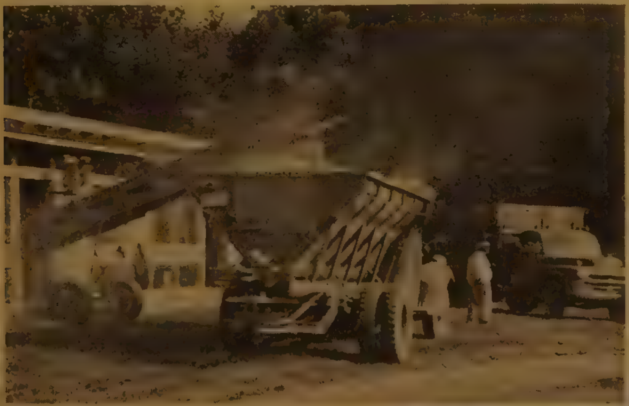

Figure 2—On the Delmarva Peninsula, poultry manure is frequently loaded into trucks of modified limespreader type, 5 to 6 tons capacity, for transportation to farm land.

Figure 3—Vigorous activation of sewage sludge takes place for a period of six hours in Milwaukee, Wisc.

Poultry Manure:

The small farm poultry flock has a greatly lessened place in total production today. Laying hens tend to be concentrated in lots of 500 to several thousand. The old roost poles have nearly disappeared, and in their place is wire netting or a floor covered with absorbent litter on which the hens may squat. Broilers marketed at about 3 pounds weight, after an 8 to 11-week growth period have assumed a large place in poultry markets. In 1956, about one billion broilers were marketed. Very few of these ever sat on a perch. One, two, or occasionally three of these young flocks are grown on one application of litter on a sandy floor.

In 1956, approximately 60 billion eggs were produced in the United States by about 314 million hens. Manure from the hens is available in one of two conditions: (1) from wire mesh cages or netting, it is removed in fresh form daily or every few days; (2) When absorbent litter is used, the house is cleaned at suitable intervals. In the meantime the odor of ammonia is often strong in the poutry house. This indicates rapid decomposition of the manure under the influence of enzymes, microorganisms, and moisture.

When chickens are raised in conjunction with farm or horticultural crops, local use of the manure is common practice. Large flocks of chickens are frequently produced on small premises, however, where no crops are grown. Here semi-commercial disposal is sometimes the prevailing practice. On the Delmarva Peninsula (Delaware, Maryland, and Virginia) three parties sometimes enter into an agreement. The poultry producer arranges with a transportation agency to clean his houses when needed. The one who cleans is then responsible for disposal of the manure. During about 8 months of the year he can receive eight to twelve dollars for a 5 to 6-ton load spread on land within a radius of about 10 miles. During the summer, while row crops are growing, the transportation agency often has to resort to stockpiling. The material undergoes composting and leaching. In some cases, this is sold and spread later, but often it is

Table 3. Chemical composition of dry poultry manure from different production systems, 1958, Eastern Seaboard area.

	Chemical Composition of Manure		
Source of Manure	% Nitrogen N	% Phosphoric Oxide P_2O_5	% Potassium Oxide K_2O
Laying hens—no litter	5.85	3.7	2-3.5
Hen manure with litter	3.27	3.20	1.85
Broiler house, one flock	2.30	2.16	1.58
Broiler house, two flocks	2.25	2.17	1.58
Broiler manure with sawdust composted in open field during winter (Delaware)	0.64	1.54	0.32

left to rot and unused. In certain New England areas, the poultry grower must remove the manure from the house or pay a fee for having the house cleaned. In several Southeastern States, the manure has varying commercial value, but never very much. In a few cases, the broiler house cleanings are dried for sale in city stores. The quantity marketed in this way is presumably small, and the potential for future marketing is not great.

Dried fresh hen manure seems a better potential product to market but demand is as yet underdeveloped. The nitrogen content is relatively high, 4-6 per cent (14, 15). A few years ago one of the large garden supply stores along the Eastern Seaboard stocked a supply of packaged dry poultry manure. During a prolonged wet period, so characteristic of that area, the odor became offensive and the entire shipment had to be discarded. The manager remarked that it would be a long time before poultry manure again is found on his shelves.

Several physical facts have changed the potential outlook since the above episode took place: (1) Inexpensive, plastic, air-tight containers are now readily available, so odor need not be a prospective trouble in stores; (2) emphasis on extremely high nitrogen content of organics is somewhat lessened, as relatively cheap forms of chemical nitrogen have become available, and (3) odorous fresh hen manure offers a challenge to the chemist to transform such material to one less odorous without severe loss of nitrogen and without lessening its availability to growing plants.

Research in the U. S. Department of Agriculture conducted some 20 years ago was directed toward preservation of poultry manure with a minimum of nitrogen loss. Unpublished data showed that building lime, quick lime, or superphosphate (16 per cent P_2O_5) used at a rate of 60 pounds per ton of fresh manure greatly diminished nitrogen losses on storage and drying. Superphosphate would seem to be the least objectionable of the additives mentioned. But such treatment would make the product relatively expensive, and might lead to the use of more phosphate than actually needed in conjunction with a complete fertilizing program.

A laying hen may be expected to consume about 140 pounds of feed, dry weight, in a year and to void about 33 pounds of manure, dry weight. This means an annual production in this country of about 8 million tons of manure (droppings), dry basis, annually. It is more difficult to estimate the quantity of manure available from broiler houses. Such droppings always fall on litter. As a first approximation, it may be estimated that the 3 billion pounds of broilers produced are responsible for about one million tons of droppings annually. This material is probably removed from the houses with twice its weight of litter.

The classes of material presently available for soil improvement include poultry manure from these: (1) one brood of broilers on litter, (2) two or even three broods of broilers on litter, (3) laying hens on litter, and (4) fresh hen droppings—no litter. The N, P_2O_5 and K_2O contents of each class of manure are given in Table 3.

When the nitrogen content of manures is greater than about 2.5 per cent, loss of ammonia from the damp material may be expected to be rather rapid over a period of several weeks. The better grades of manure should therefore be dried promptly, preserved, or applied to land soon after removal from the house of production. Much of the material will no doubt continue to be applied to land on the farm or in areas near the place of production. On the other hand, preparation of droppings for use by city gardeners offers a possibility of some expansion.

Growers of corn and soybeans along the Eastern Seaboard look with favor on the use of poultry manure in conjunction with chemical fertilizers. It appears to be especially valuable for corn. The growers are willing to pay some money for it applied to their land, but they are not usually willing to pay the prices necessitated by commercial processing, bagging, and shipment.

Sewage Sludges:

What are the fertilizer potentialities of sewage sludges in the United States? This question is not easily answered, but may be approached from several viewpoints. Approximately 100 million people live in cities of 2500 or more population. Most of these municipalities have sewage disposal systems that permit recovery of a small to a major part of the solids entering the sewers (4). The effectiveness of these plants is highly variable. The food consumption per person amounts to about 1.5 pounds of dry matter per day. The nitrogen content of his food has been estimated to be about 3.4 per cent, phosphoric oxide about 1.2 per cent, and potash about 0.9. A widely varying amount of the nitrogen is recovered in sludge. The sludge may contain even more phosphoric oxide than was present in food because of the contribution from detergents and from garbage ground in homes and restaurants. The potash of organic matter is mostly water-soluble and hence lost in the sewage effluents.

Sewage disposal is an expensive item in city government. Although sludge from certain plants is sold, the returns cannot be expected to cover more than a very small part of the total cost of processing.

Sewage processing plants fall into two general classes: (1) those which separate the solids by gravity-settling only, with anaerobic digestion of the solids for 10-15 days. This is usually referred to as primary treatment; and (2) those plants which include aeration of the sludge with or without chemical treatment. When the solids are heat-treated and dried, they serve as a good quality nitrogenous fertilizer, approximately the equivalent of certain seedmeals. On the other hand digested sewage is of lower nitrogen content and less readily nitrified. Data pertaining to the fertilizing qualities of materials prepared in the two general classes of disposal systems are given in Table 4.

It will be observed that the nitrogen contents of digested sludges, usually from primary treatment, are less than half the amount normally found in activated sludges, which come from secondary treatment of the solids not digested. Furthermore, the nitrogen of digested sludges is much more slowly nitrifiable than that in digested materials.

The total nitrogen content of activated sludge is about 2-½ times that of digested sludge, and the extent of nitrification during a growing period is about 2-½ times greater. This indicates that activated sludges should have about six times the fertilizer value of digested products per unit of weight. There is a wide difference in prices that people are willing to pay for the two classes of sludges. The prevailing situation at a few city plants will illustrate current differences in commercial value.

Milwaukee, Wisconsin, produces about 160 tons of pelleted activated sludge daily (see Table 4). It is sold under a trade name at a current wholesale price of about 44 dollars per ton in carload lots f.o.b. Milwaukee. It is used widely on lawns in different parts of the United States. Chicago produces a similar product, not pelleted and dusty, in much larger quantities than Milwaukee. It is not advertised widely and is sold to fertilizer companies for inclusion in mixed goods, particularly for lawn fertilizers, price about 28 dollars per ton f.o.b. Chicago. Materials not sold are incinerated.

Washington, D. C., produces about 120 tons of damp, digested sludge daily (see Table 4). On a dry weight basis, this is equal to about 40 tons. Flash-drying equipment is available but not used, because of inability of the city to market the sludge at a price that covers cost of heat-treatment and drying. At present, damp sludge is available to anyone who will haul it away. Much of the product is taken by the National Capitol Park Service and by adjoining County governments responsible for upkeep of public grounds.

Baltimore, Maryland has a sewage disposal system that combines primary treatment with activation of part of the material, then subsequent digestion of all solids. The heat-treated material has a nitrogen content of about 3.0 per cent and is sold to a jobber for delivery to different fertilizer companies. The price at the Sewage Works is about 5 to 7.5 dollars per ton.

The dewatering of sewage sludge is very expensive. This is sometimes accomplished on sand-gravel beds. The air-dry material is frequently removed from these beds by farmers, or by other parties interested in its use for soil improvement. In small cities where farm land is nearby, delivery of the unfiltered sludge containing 1 to 5 per cent of solids is sometimes made to growers of field crops. The price is frequently about enough to pay cost of delivery in 1000-gallon tank trucks. Spreading is done as a part of delivery service.

Undoubtedly, increasing quantities of activated sludge will be produced. The process leads to cleaner streams, because of the greater amount of solids removed. This is often referred to as secondary treatment. Washington, D. C. is now converting to this system. Utilizing of both types of sludge will probably continue to be by local gardeners for soil improvement. The economic outlook for greatly expanded sale of such material is not bright.

Table 4. Chemical compositions of certain sewage sludges differently processed (4).

	Primary fertilizing constituents			
Kind of sludge and location of plant	Nitrogen (N) total	Phosphoric oxide (P_2O_5) total	Potassium oxide (K_2O) acid soluble	Ash
	Per cent	Per cent	Per cent	Per cent
Activated Sludges				
Chicago, Ill.	5.60	6.97	0.56	37.4
Milwaukee, Wisc.	5.96	3.96	.41	27.7
Digested Sludges				
Washington, D. C.	2.06	1.44	.14	56.2
Rochester, N. Y.	2.54	1.16	.29	42.8

Conclusion of this article,—discussing preparation of garbage and wood products for fertilizer use will appear in the March issue.

Preliminary Fertilizer Consumption Report For 1958 Shows Decrease of 351,000 Tons

by

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Fertilizers

THE consumption of fertilizers in the United States and Territories (Hawaii and Puerto Rico) during the year ended June 30, 1958, was 22,358,000 tons, a decrease of 351,000 tons (1.5 per cent) from that used in the preceding year (Table 1). Consumption of mixed fertilizers amounted to 14,252,000 tons—a decrease of 451,000 tons (3.1 per cent)—and of materials for direct application to 8,106,000 tons—an increase of 100,000 tons (1.2 per cent). Included in the materials are 7,155,000 tons of products containing one or more of the primary plant nutrients (N, available P_2O_5, K_2O), 940,000 tons of secondary and trace nutrient materials, and 11,000 tons not classified. The use of materials containing primary nutrients increased 92,000 tons (1.3 per cent), and secondary and trace nutrient materials decreased 3,000 (0.3 per cent) from the respective quantities in 1956-57.

The consumption of all fertilizers increased in 26 areas and decreased in 25 areas. While most states in the northeastern, north central, and western half of the continent used more fertilizers, all states in the southeast and most of those in the south central part used less. More than one-half of the decrease in consumption of fertilizers was due to the decrease in the South Atlantic and East South Central regions and the Territories.

Mixtures

THE consumption of mixed fertilizers increased 160,000 tons in 25 areas and decreased 611,000 tons in 26 areas. Areas in which the principal increases and decreases occurred followed closely those areas having corresponding changes in consumption of all fertilizers.

Fifteen grades represented 64 per cent of the tonnage of mixed fertilizers consumed on the continent in 1957-58. Of these, 14 also were the grades used in largest tonnage in 1956-57 (grade 3-9-6 having been replaced by grade 5-10-15). Although the tonnage of these individual grades changed, the combined totals of these 14 were nearly the same in both years (8,651,000 tons in 1957-58 and 8,703,027 tons in 1956-57), and represented over 60 per cent of the consumption in each year. In all regions except the Mountain and Pacific, the tonnage of the 15 grades listed below represented over 30 per cent of the total tonnage of mixed fertilizers consumed in the respective regions. The trend in the Mountain and Pacific regions is to use grades having generally less potash than shown by the average of these 15 grades.

15 Principal Grades of Mixed Fertilizers Consumed in the U. S. in the year ended June 30, 1958.

5-10-10	3-12-12	5-10-15
4-12-12	12-12-12	4-10-7
5-20-20	3-9-9	2-12-12
4-16-16	5-10-5	0-20-20
10-10-10	6-12-12	6-0-8

Materials

In 32 areas, consumption of materials for direct application was 463,000 tons higher, and in 19 areas 363,000 tons lower than in 1956-57. Use of materials increased in all states of the New England and East North Central regions, and most of the states in the West North Central, Mountain, and Pacific regions. Decreases were in most of the southeastern and south central states, and the Territories.

Chemical nitrogen products were the only class of materials that showed an increase in 1957-58. The use of anhydrous ammonia increased 124,000 tons, nitrogen solutions 71,000 tons, and ammonium sulfate 57,000 tons. The consumption of anhydrous ammonia and nitrogen solutions increased in all

- **Consumption of primary plant nutrients registers 1.4% gain**
- **Overall fertilizer tonnage down 1.5%**
- **Mixed fertilizer use down 3.1%**
- **Direct application fertilizers up 1.2%**
- **Fertilizer use up in 26 states,—down in 25**
- **Use of organic material down 12,000 tons**
- **Weighted average of primary plant nutrients in mixed fertilizers reaches new high of 30.26%**

regions except the Territories. The use of other chemical nitrogen products was generally lower in 1957-58 than in 1956-57.

The total use of natural organic materials decreased 12,000 tons but the consumption of dried manures increased 3,000 tons.

While the consumption of all phosphate materials decreased 5,000 tons, the use of ammonium phosphate and phosphate rock (including colloidal phosphate) increased 74,000 and 11,000 tons, respectively. The use of basic slag and normal and concentrated superphosphates decreased 8,000, 81,000, and 5,000 tons, respectively. The increase in ammonia phosphates and decrease in the other phosphate materials was general throughout all regions.

The consumption of potash materials decreased 26,000 tons and was lower in each of the regions.

Primary Plant Nutrients

THE total quantity of primary nutrients contained in all fertilizers was 6,465,000 tons. This was 88,000 tons (1.4 per cent) more than in 1956-57. The total for 1957-58 comprised 2,264,000 tons of nitrogen, 2,280,000 tons of available P_2O_5, and 1,921,000 tons of K_2O. These quantities represent an increase of 129,000 tons (6.0 per cent) for nitrogen and decreases of 24,000 tons (1.0 per cent) for available P_2O_5 and 17,000 tons (0.9 per cent) for K_2O. Although the total quantity of fertilizers carrying primary nutrients was 359,000 tons below consumption in the preceding year, the lower tonnage of fertilizers contained 88,000 tons more primary nutrients than the larger tonnage in 1956-57. This increase was due to the greater use of the chemical nitrogen materials.

The total consumption of primary nutrients contained in mixed fertilizers amounted to 4,313,000 tons, comprising 848,000 tons of nitrogen, 1,789,000 tons of available P_2O_5, and 1,676,000 tons of K_2O. These quantities represent 4,000 tons (0.5 per cent) more nitrogen, 28,000 tons (1.5 per cent) less of available P_2O_5, and 6,000 tons (0.4 per cent) less of K_2O. Materials used for direct application contained 1,416,000 tons of nitrogen, 491,000 tons of available P_2O_5, and 245,000 tons of K_2O. These quantities represented increases of 125,000 tons (9.7 per cent) for nitrogen, 4,000 tons (0.8 per cent) for available P_2O_5, and a decrease of 11,000 tons (4.3 per cent) for K_2O.

The weighted average of the primary nutrients contained in mixed fertilizers was for nitrogen, 5.95 per cent; for available P_2O_5, 12.55 per cent; for K_2O, 11.76 percent; and for the total of those nutrients, 30.26 per cent. The corresponding values in the preceding year were 5.74, 12.36, 11.44, and 29.54 per cent. The proportionate increase was highest for nitrogen and lowest for P_2O_5.★★

Table 1.--Fertilizers consumed as mixtures and as materials, year ended June 30, 1958, compared with consumption of previous year, by State and region[1] (Preliminary)

State and region	Mixtures	Materials[2]	Total	
			Consumption	Change from year ended June 30, 1957
	1,000 tons	1,000 tons	1,000 tons	1,000 tons
Maine	171	11	182	10
New Hampshire	15	5	20	1
Vermont	42	17	59	4
Massachusetts	69	18	87	[3]
Rhode Island	16	2	18	1
Connecticut	66	23	89	4
New England	379	76	455	20
New York	522	81	603	25
New Jersey	222	24	246	-23
Pennsylvania	570	70	640	6
Delaware	74	4	78	-10
District of Columbia	3	1	4	1
Maryland	267	16	283	-9
West Virginia	64	9	73	-9
Middle Atlantic	1,722	205	1,927	-19
Virginia	610	98	708	-64
North Carolina	1,162	302	1,464	-103
South Carolina	526	207	733	-85
Georgia	992	256	1,248	-46
Florida	1,296	165	1,461	-16
South Atlantic	4,586	1,028	5,614	-314
Ohio	950	103	1,053	18
Indiana	856	225	1,081	-6
Illinois	531	891	1,422	52
Michigan	554	61	615	-22
Wisconsin	394	42	436	10
East North Central	3,285	1,322	4,607	52
Minnesota	323	122	445	19
Iowa	332	202	534	65
Missouri	402	354	756	-46
North Dakota	30	76	106	25
South Dakota	11	23	34	9
Nebraska	30	202	232	63
Kansas	63	128	191	-21
West North Central	1,191	1,107	2,298	114
Kentucky	431	92	523	-19
Tennessee	400	92	492	-53
Alabama	693	269	962	-78
Mississippi	254	374	628	-118
East South Central	1,778	827	2,605	-268
Arkansas	139	151	290	-37
Louisiana	148	129	277	-12
Oklahoma	57	50	107	-1
Texas	286	381	667	72
West South Central	630	711	1,341	22
Montana	3	36	39	-5
Idaho	12	92	104	18
Wyoming	2	10	12	2
Colorado	15	66	81	22
New Mexico	2	37	39	1
Arizona	32	172	204	26
Utah	6	26	32	-1
Nevada	3	19	22	15
Mountain	75	458	533	78
Washington	53	192	245	66
Oregon	26	165	191	-27
California	302	[4] 1,871	2,173	45
Pacific	381	2,228	2,609	78
Continental U. S.	14,027	7,962	21,989	-235
Hawaii	46	90	136	-58
Puerto Rico	179	54	233	-58
Territories	225	144	369	-116
Total: 1957-58	14,252	[5] 8,106	22,358	-351
1956-57	14,703	[5] 8,006	22,709	[illegible]
1955-56	14,776	[5] 7,418	22,194	-515

[1] Includes fertilizers distributed by Government agencies. Due to rounding, column or cross totals may not balance.

[2] Includes: ground phosphate rock and colloidal phosphate, basic slag, secondary and trace nutrient materials, as borax, metallic salts, sulfur, gypsum, etc. used as separate materials. Does not include liming materials or the quantity of materials used for manufacture of commercial mixtures.

[3] Less than 500 tons.

[4] Includes an estimated 260,000 tons of dried manures.

[5] Materials included not guaranteed to contain N, P_2O_5, or K_2O totaled 940,000 tons in 1957-58, 943,243 tons in 1956-57, and 789,605 tons in 1955-56.

The NEMATODE Problem

by Joseph F. Spears

Agricultural Research Service
Plant Pest Control Division
U. S. Department of Agriculture

Conclusion of a two-part article reviewing the use of commercial nematocides and estimating their market potential.

Soybean Cyst Nematode

Soybean cyst nematode, which is capable of destroying a crop of soybeans, and which was previously known only in the Orient, has been found on nearly 20,000 acres in Arkansas, Kentucky, Mississippi, Missouri, North Carolina, Virginia, and Tennessee.

Described by Japanese scientists in 1952 as a new species, the soybean cyst nematode has as additional hosts adzuki bean, snapbeans, lespedeza, common vetch, and has recently been discovered to attack certain weeds, hemp sesbania, white lupine, and henbit deadnettle.

The soybean cyst nematode was first discovered in New Hanover County, North Carolina, in the summer of 1954 following a report of crop damage by a grower who had experienced progressively reduced yields over a period of several years. In the short time that the nematode has been known in this country, it has not been possible to evaluate fully its economic potential; however, the prospects on some infested fields have been so poor, that farmers did not harvest the soybeans. One farmer who did harvest an infested field obtained 4 bushels of soybeans per acre.

Experiments conducted in North Carolina indicate that normal yields of beans can be obtained on fumigated soil, compared with nearly complete crop failure on unfumigated soil. There is no proven method of complete eradication of the soybean cyst nematode from infested soil; however preliminary investigations indicate that this cyst nematode does not have the same survival rate as does the golden nematode and apparently it is more amenable to chemical control.

Soybean plants damaged by the nematode are usually dwarfed, yellowed, and low in yield; however, such an appearence alone is not reliable as evidence of nematode presence, since other conditions may cause similar plant response. Damage to plants attacked by the nematode is due primarily to feeding that may be best described as a piercing, sucking action which is accomplished with specialized mouth and throat structures. Plant juices are sucked into the digestive tract, thus depriving the host of its nutrition.

Federal quarantine for the soybean cyst nematode was invoked on July 25, 1957. The purpose of Federal regulatory action is to prevent spread of this pest to other soybean-growing States not known to be infested. The movement of soil from infested fields by any means represents the greatest risk of spread. It is fortunate that this nematode has not yet been found in the chief soybean-producing belt of the United States. Surveys to date show that the nematode is established in three main areas, largest is a narrow strip straddling the Mississippi River and extending from southwestern Kentucky to northwestern Tennessee. The other two main infested areas are in North Carolina; one includes New Hanover and Pender Counties, and the other includes an area on the Virginia, North Carolina line.

State agriculturists in cooperation with Plant Pest Control Division personnel made a 25-state survey in 1957, and the survey has

Field crew collecting root samples in a citrus nursery. All nurseries are sampled to prevent infested stock from being planted in an established or new grove.

Two soybean plants from the same field. The plant in the left hand of the subject shows unthriftiness due to attack by the soybean cyst nematode. Severe infestations can cause complete loss of production.

been continued and expanded in 1958. Altogether more than 1.2 million acres have been inspected by examining soil, pulling plants, checking roots for clinging nematodes, and visually checking fields for yellow spots that might reveal the feeding of the nematode.

Burrowing Nematode

It has been said that three out of four oranges and nine out of ten grapefruit produced in this country come from Florida. The citrus industry in Florida holds an important place in the nation's economy since 73 per cent of all citrus fruit in the United States comes from Florida. The citrus industry in Florida has prospered by "licking" one problem after another. Growers have moved south in the state to avoid frost damage. They have changed fertilization procedures to correct nutritional problems. They have avoided *Triztesia,* quick decline, by using rough lemon stock, and they have twice within the past 25 years eradicated the Mediterranean fruit fly. Now they have one more factor to cope with. This is a condition in groves which they call spreading decline.

Trees affected with the disease were first noted in a grove near Winter Haven between 1926 and 1928. Trees affected were characterized by stunted nonthrifty appearance. Foliage was sparse, leaves and fruit undersized. Diseased trees rarely died but remained in a nonthrifty condition indefinitely. Fruit produced became unprofitable in badly affected groves due to low yields. This particular decline condition differed from other declines present in Florida groves in its characteristic manner of spreading. Unlike other declines, spreading decline moved equally in all directions from centers of infestation—uphill as readily as downhill, at a nearly constant rate of 50 feet per year. Paved highways, railroads and other man-made obstacles failed to halt its advance. Once established in a grove, the disease spread until entire plantings were overrun.

The seriousness of spreading decline became apparent during the 1930's, and in 1935 studies were started to determine the cause of the disease. Nutritional deficiencies, fungi, viruses, and soil toxins were eliminated one by one as suspected causal factors. The nematode had played its best deceptive role up to this time, but in 1946 scientists began to focus their attention on the nematode problem. In 1953, nearly 25 years after the discovery of spreading decline, Drs. R. F. Suit and E. P. DuCharme, Florida Citrus Experiment Station research scientists, attributed the cause to the burrowing nematode, *Radopholus similis.*

This parasitic eelworm approximately 1/40th of an inch long was first found on bananas in the Fiji Islands in 1890. It is known to occur in the tropic and subtropical regions of the world. As the common name implies, burrows are formed in the cortical tissue of young feeder roots as a result of the feeding action of the nematodes. This causes the roots to deteriorate. Females deposit eggs within the roots where the young hatch and feed. When the food supply at hand is exhausted, the nematodes migrate in search of a new supply. They travel in all directions, thus accounting for the creeping or spreading nature of the disease.

The host range of the burrowing nematode is extremely wide. Approximately 125 species of plants known in Florida are hosts. Strangely enough, the majority of host plants show little or no damage from attack by the pest. Damage to economic plantings is restricted to citrus and avocados, with the proportionate damage to the citrus industry far exceeding that incurred by avocado growers.

Scientists studying spreading decline rated this new menace as more formidable than citrus canker, Mediterranean fruit fly, or citrus blackfly. With the disclosure that the burrowing nematode was the cause of spreading decline, Florida Citrus Experiment Station turned full attention to the research phases of the problem and the State Plant Board immediately entered into an active fight to contain the infestation. The Plant Pest Control Division joined in the fight by assigning survey crews and laboratory personnel to assist the state. In 1955, the Legislature appropriated $1,800,000 for the program.

The states' control program, which involved the removal of infested trees and the treatment of the soil with D-D, was adopted as the only effective means known for containing the pest.

There is evidence that some citrus rootstock varieties may show tolerance to nematode attack. Citrus rootstocks resistant or tolerant to nematodes would prove invaluable, if it became necessary to live with the pest. More than 1,500 varieties, species, and relatives of citrus are now being tested under a cooperative program by ARS and Florida Citrus Experiment Station.

Potato Rot Nematode

The potato rot nematode is another nematode problem on which the Plant Pest Control Division has been called to give assistance. The potato rot nematode has apparently existed in Europe for many years, where in 1888 it was considered a special strain of the widely-known bulb nematode. Studies by Mr. Gerald Thorne in 1945 led him to consider this nematode as a distinct species, *Ditylenchus destructor.*

In 1945, the Pest Protection Division of the Canadian Department of Agriculture announced the finding of the potato rot nematode on several farms in seed-producing areas of Prince Edward Island. This well-known seed-producing center makes large shipments of certified seed each year to many of our eastern states and, at the time of discovery, several carlots of the 1945 crop had already been delivered to the United States. The Bureau of Entomology and Plant Quarantine was promptly notified and furnished with information on the car numbers and certificate numbers covering seed potatoes which had moved into the United States. As a result some seed potato shipments in the United States were found to be infested and were destroyed.

During the summer of 1946, extensive surveys of potato plantings and potatoes at harvest time were conducted by our agency. Subsequent surveys along the eastern seaboard failed to reveal infestations; however, in 1948, potato rot nematode was discovered in Aberdeen, Idaho, and prompt regulatory and control measures were initiated. In 1953, the pest was found at Antigo, Wisconsin, and similar regulatory and control measures were taken. Extensive surveys in the Pacific northwest and Rocky Mountain areas failed to reveal other infestations. However, in February 1958, the potato rot nematode was discovered in Oregon infesting dahlia tubers.

The finding of potato rot nematode-infested dahlias was not particularly surprising, since research conducted by several workers, particularly in England and Canada since 1945 had shown that *D. destructor* had a wide variety of hosts. In 1951, J. B. Goodey reported that he had conducted cross inoculation experiments that showed the eelworm causing disease in potato tubers would invade and cause characteristic symptoms in iris bulbs. It now appears that the potato rot nematode can be considered a polyphagous species with a wide variety of hosts.

This Florida citrus grove is heavily infested with the burrowing nematode. Sparse foliage is one of the telltale signs that the destructive burrowing nematode is at work on the roots. The parasite spreads through the soil at about 50 feet a year.

Tobacco Cyst Nematode

During the fall of 1951, a cyst nematode was discovered in Connecticut attacking tobacco. It appeared to be morphologically indistinguishable from the golden nematode. Research work was started immediately on the problem, and it soon developed that this new cyst nematode would attack tobacco and tomatoes, but would not mature on potatoes. The golden nematode will attack potatoes and tomatoes, but tests indicated that it would not mature on tobacco. Later, Lownsberry and Lownsberry found distinguishing characteristics and suggested that the tobacco cyst nematode be established as *Heterodera tabucum.*

The Plant Pest Control Division, in cooperation with the states, conducted surveys in 1951-53 for the tobacco cyst nematode. All major tobacco-producing states were inspected carefully without finding this new cyst nematode outside of the limited shade tobacco-producing area near Hazardsville, Connecticut, nor has this cyst nematode been reported from any other country in the world. However, agricultural workers in all tobacco-producing states should be alert to the presence of this cyst nematode.

Publicity resulting from the finding of the golden nematode in the United States, and the passage of the Golden Nematode Act by the 80th Congress in June 1948 did much to focus attention on nematodes as a pest control problem. In 1945, chemical companies after years of research began to market chemicals with nematocidal qualities. People who tried these new chemicals saw production jump 25 to 50 per cent. Today, nematocides are used on nearly three quarter million acres, and this use is increasing rapidly each year. However, the use of nematocides is still small compared with the insecticides and fungicides used annually in the control of insects and plant diseases.

The plant parasitic nematode programs discussed here are illustrations of a new field of quarantine and plant pest control. Attention to these nematode problems has not kept pace with the comparable fields of plant pathology and entomology. Any pest that entrenches itself in this country is a challenge to agriculture and federal and state agricultural workers. Few pests offer a greater challenge than plant parasitic nematodes. To solve the problems they pose we must meet them head-on with vigor at our command.★★

Experimental Fertilizer Processing Unit At Grace's Washington Research Center

AN experimental fertilizer processing unit, capable of performing the major functions of a wide variety of fertilizer processes, is in use at the new Washington Research Center of W. R. Grace & Company at Clarksville, Maryland.

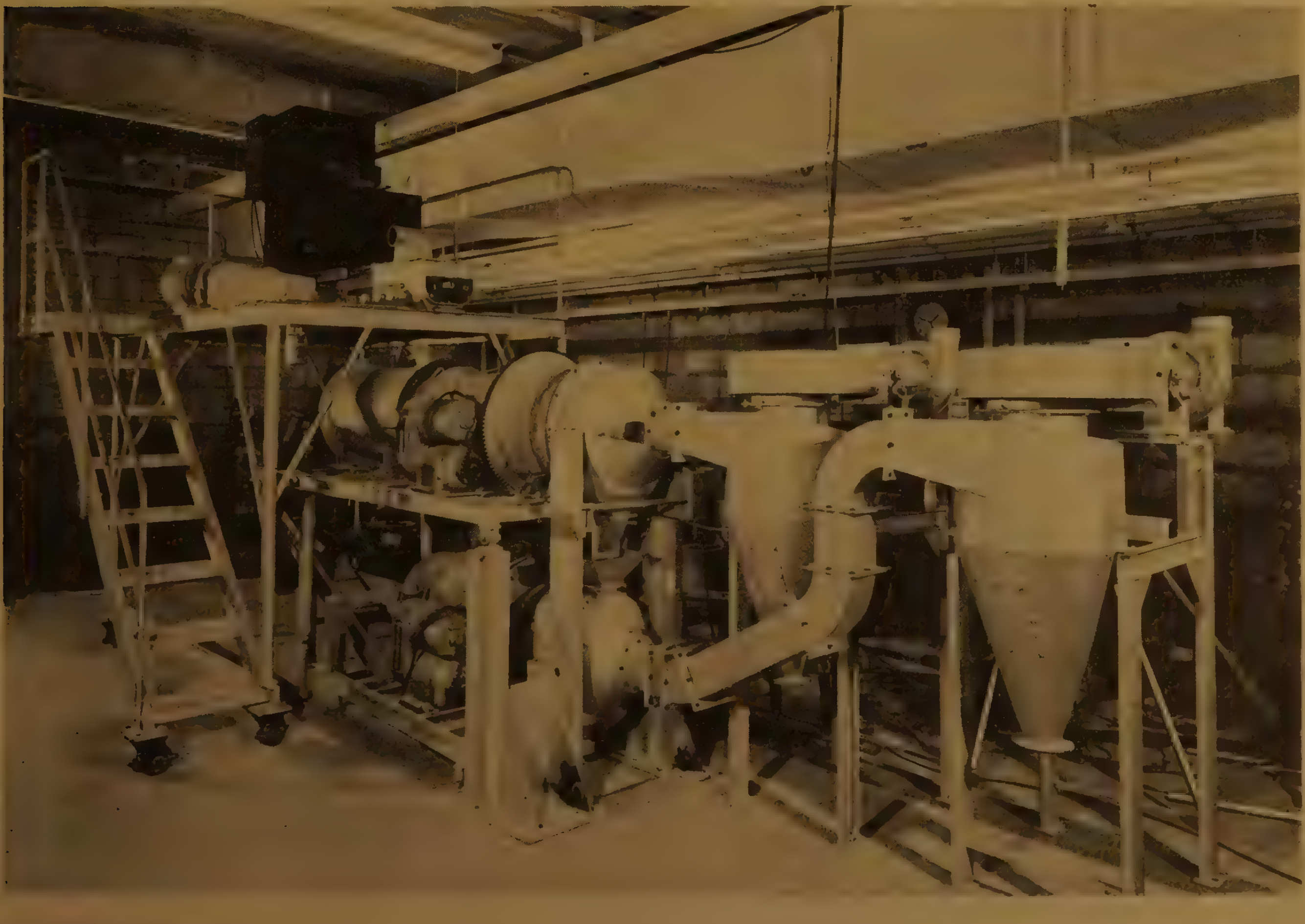
The increasing complexity of chemical processing equipment in recent years for all major phases of fertilizer production has emphasized the need for process and product development. The need for equipment to assist with the development of improvements to existing processes and for equipment to determine requirements for new processes has become increasingly apparent.

Operating flexibility and precise controllability were incorporated into the continuous flow unit. It was patterned after the Davison-Trenton granulation process described by Reynolds (*Ag. Chemicals,* Feb. 1957) with adjustments made as necessary to assure maximum ease of component rearrangement. The unit was fabricated by Edward W. Renneburg & Sons Company, Baltimore, Maryland. Its production rate is from 50 to 200 pounds of granulated mixed fertilizer. The pre-blended dry raw materials and recycle materials are fed continuously to the double paddle shaft pug mixer by a vibratory gravimetric feeder. The liquids—sulfuric and phosphoric acids, anhydrous ammonia, nitrogen solutions and water, are metered continuously to the pug mixer through rotameters. The hot damp granulated material flows by gravity from the pug mixer into a direct fired rotary dryer which can be operated either co-current, as shown, or countercurrent by simply re-arranging the feed and discharge chutes, reversing the tube, and relocating the upper operations platform which is portable. The furnace is of a refractoryless design and the cooler tube, the cyclone dust collectors and the exhaust units are a standard design. An inclined conveyor not shown in the photographs conveys the product to classifying screens. All parts of the unit which come in contact with the fertilizer materials are made of stainless steel.

Figure 1 shows the unit as installation neared completion. The

(*Continued on Page* 127)

Figure 1. Experimental Mixed Fertilizer Granulation Unit



New Pesticide Products

Completion of a 3-part article reviewing the new pesticides. An alphabetical listing is included of some 72 products introduced in the past two years.

Phosdrin

PHOSDRIN, an organic phosphate insecticide, is designed for control of a wide range of crop pests and particularly useful for "close to harvest" application because it is short lived in or on plant tissues. It may safely be applied within one to four days of harvest and thus is particularly useful when late season control is necessary. A systemic, Phosdrin was formerly designated OS 2046 by its manufacturer, Shell Chemical Corp. In addition to aphids and mites on which most phosphate type insecticides are effective, Phosdrin also is said to be particularly good in controlling caterpillars, leaf beetle larvae, the true bugs, leaf miners and leaf hoppers. Tolerances have been stablished and label registrations granted for application on more than 30 crops.

Phaltan—Calspray Fungicide

PHALTAN, (N-trichloromethyl thiophthalimide) is a new fungicide which appears to be very effective on a number of fungi of economic importance on fruit, vegetables, and ornamentals, where present control are less effctive. California Spray Chemical Corp., Richmond, Calif., indicate that Phaltan will be available commercially in 1959, particularly for use on roses. It is available as a 50% wettable powder, and in dust formulations of 5, 7.5 and 10% active. Other formulations will be prepared on request.

California Spray Chemical indicates that Phaltan 50w has given excellent control of anthracnose of tomatoes, downy mildew of grapes, powdery mildew of grapes, downy mildew of cucurbits, black spot, and powdery mildew of roses, late blight of potatoes and tomatoes, cherry leaf spot and blossom blight of cherries, scab on citrus, summer diseases of apples, bitter rot and black rot, powdery mildew of melons and downy mildew of lettuce.

Phaltan 50 Wettable Fungicide has shown a range of plant safety similar to Orthocide 50 Wettable. Some injury has been noted from applications on D'Anjou Pears. Also, under high temperature conditions, heavy dosages may injure some varieties of grapes and seedling cucumbers. The finish of some apple varieties may be impaired due to application during the period 4-6 weeks after bloom. It appears, however, that practical safe schedules may be developed.

In acute oral toxicity studies on male albino rats, all animals survived at the highest dosage level tests for Phaltan of 10.0 gm/kg of body weight. Users are advised to observe the same precautions as are customary for handling captan. The dust may be irritating to mucous membranes.

New Dow Herbicide

Agricultural research laboratories of the Dow Chemical Company are testing a new pre-emergence herbicide which may prove effective for control of weeds in farm crops and crab grass in turf. Applied prior to the crab grass season, the compound promises to prevent growth of the weed. The new material also shows promise for control of other turf weeds such as muhlenbergia and chickweed, according to Dow spokesmen.

In addition to meeting turf weed problems, the new compound also promises to be useful as a pre-emergence or early post-emergence weed killer in crops such as soybeans, cotton, corn, snapbeans, peanuts, and peas.

The material is undergoing further research trials to prove its utility. As yet there are no stocks available for sale or general sampling. As a matter of fact the new herbicide does not yet have a name. It will be given further laboratory and field testing by Dow this coming year and will be sampled to public research agencies for additional testing.

Aqualin Herbicide

A NEW herbicide, Aqualin, has recently been developed by Shell Development Co. and will be made available to licensed applicators for field use in some sections of the U. S. during the coming 1959 season. Aqualin is a potent sulfhydril reagent that destroys the biochemical system of a plant cell by reacting with its enzyme system. A process for employing the new herbicides to control submersed aquatic vegetation has been developed by Shell (patent applied for) which involves metering the material into canals, ponds, ditches and other water areas where submersed vegetation constitutes a nuisance.

The process has been studied and evaluated over the past two seasons by Shell scientists in cooperation with irrigation and drainage district personnel. Research will continue to develop useful new application techniques during 1959.

Aqualin exhibits the demerits of being toxic, flammable and quite reactive chemically. However, it is stated that if appropriate procedures are employed and necessary precautions observed, weed control can be carried out safely and effectively with the new material. Fish kill will result under some circumstances, but game-fish are said to be less susceptible than rough fish, and effective weed control has been obtained with little or no loss of fish.

Glyoxide Dry-Fungicide

DEVELOPMENT of a new, high finish fungicide formulation for the control of fruit growing diseases, such as apple scab and cherry leaf spot, has been announced by the Corona Chemical Division of Pittsburgh Plate Glass Company, Pittsburgh, Pa.

The new product known as Glyoxide Dry is a wettable powder fungicide having mite-suppressing action on apples. The clean, white, free-flowing micronized wettable powder contains 75 per cent active ingredient. It is effective at a low dosage, making it desirable for concentrated spray applications.

Glyoxide Dry is compatible with most of the commonly used organic insecticides and fungicides, and its spreader-sticker action often increases the effectiveness of the other spray chemicals with which it is used.

Field testing by experiment stations has shown that Glyoxide Dry is an effective fungicide, which provides fruit growers positive disease control of apple scab and cherry leaf spot from the early pre-cover sprays right up to harvest time. The new product is safe to handle and easy to apply. It is produced and packaged in 25-lb. bags at the Corona Division in Moorestown, New Jersey.

Korlan 25W for Fly Control

KORLAN 25W, (Dow Chemical) a wettable powder formulation containing 25% O,O-dimethyl 0-2,4,5-trichloropenyl phosphorothioate, technical grade, will be available economically for the 1958 use season. Korlan 25W has received United States Department of Agriculture label approval for fly control use in dairy barns, other farm buildings, refuse areas.

It is rcommended that Korlan 25W be applied as a residual spray containing one per cent active ingredient concentration. A single application may be expected to give effective housefly control for from four to six weeks or longer.

The active ingredient of Korlan 25W is said to exhibit a low degree of toxicity to warm-blooded animals, yet it is reported to be highly effective against many different kinds of insects.

SD-4402 (Experimental Insecticide)

SD-4402 is a new experimental insecticide which is a product of recent research work by Shell Development Co. It will be available for experimental trial use only during the coming 1959 season. It was field tested for the first time in 1958, and tests will be expanded in 1959. Its rather lengthy chemical name is 1,2,3,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-4, 7-methano-naphthalan). A chlorinated hydrocarbon insecticide, it is said to have shown particular effectiveness in test studies on lepidopterous larvae (worms), coleoptera and diptera.

Atrazine—Geigy Herbicide

A NEW triazine herbicide Atrazine 50W, has been announced recently by Geigy Agricultural Chemicals, division of Geigy Chemical Corporation. The herbicide is suggested for non-selective or industrial weed control on non-cropped land.

The new triazine compound, a 50% wettable powder, controls annual broadleaf weeds and grasses and many perennial weeds. It may be applied not only before weeds emerge but also within several weeks following weed emergence. The new compound is a valuable addition to Geigy's Simazine 50W herbicide, previously introduced for industrial weed control two years ago, which was intended

(*Continued on Page* 121)

Listing of New Pesticide Products

ACP M-460—See Dinoben.

Amo-1618—New growth regulant effective as dwarfing agent for plants. Chemically, 2-isopropyl-4-dimethylamino - 5 - methylphenyl - 1 - piperidine carboxylate methyl chloride.

Aqualin — Shell Chemical Corp., New York. A sulfhydril reagent that destroys the biochemical system of the plant cell by reacting with vital enzyme systems. Process using this agent is for control of submersed aquatic vegetation.

Amoben—AmChem Products, Inc., Ambler, Pa. Herbicide known also as ACP M-629. A formulation of 2,5-dichloro-3-amino benzoic acid.

Amitrol—AmChem Products, Inc., Ambler, Pa. Herbicide for quack-grass control. Formulation of 3-amino-1,2,4-triazole.

Amobam—Roberts Chemicals, Inc. Nitro, W.Va. Diammonium ethylene bisdithiocarbamate formulation for control of rust mite on citrus and for aid in control of melon worm and pickle worm on squash.

Atrazine—Geigy Agricultural Chemicals, Ardsley, N. Y. A new triazine herbicide for non-selective use.

B-622—See Dyrene.

Bacillus Thuringiensis—Merck & Co., Rahway, N.J. Microbial pathogen showing promise of a new approach to pest control through microbial pesticides.

Bayer 22555 — Chemagro Corp., New York. An experimental soil fungicide and seed treatment. Chemically, P-dimethyl amino benzenediazo sodium sulfate. Reported to exhibit special merit as a seed treatment chemical on sugar beets, peas and beans. Also effective for some uses as a soil fungicide.

Chlorobenzilate—Geigy Agricultural Chemicals, Ardsley, N.Y. Miticide for control of various species of mites on apples, pears and other fruit and agricultural crops.

Chlorobenside—Boots Pure Drugs, England. Herbicide sold in U. S. as "Mitox." Chemically, p-chlorobenzil, chlorophenyl sulfide.

(*Continued on Page* 130)

IMC Holds Nine Fertilizer Sales Clinics

INTERNATIONAL Minerals & Chemical Corporation launched its broadened, second-stage "Full Orbit" program for 1959 with a series of nine fertilizer sales training clinics January 5 through February 3. The general verdict of 156 fertilizer manufacturing companies stamped the program as a major success.

Using down-to-earth principles specifically applicable to the fertilizer industry, the International task force nailed down such subjects as prospecting for sales, the right approach, overcoming objections, closing, effective use of selling time, advertising, and sales aids.

Topics were picked by the companies themselves in a survey conducted last year by IMC.

Specific steps by which a fertilizer salesman can determine the potential of his territory were outlined. Another topic stressed that objections, when anticipated, can be turned into sales.

Colored slides, blackboard, and flip charts were used to emphasize key points. IMC's four-man teams used information and techniques gleaned from the research and sales service staff of the 50-year old company to compile its compact, documented, and well-illustrated clinic.

"It was a pleasent surprise," said one participant, "to find no sales pitch, no frothy generalities, and no wasted time."

How to sell quality instead of price, a major topic at the meetings, prompted many favorable comments by participants. Others lauded the attention to fundamentals, timeliness of the topics, and the organization and presentation of the material.

Stanley Hackett, president, Dixie Fertilizer Company, of Shreveport, La., said: "This type of meeting should be expanded so everyone gets a chance to attend. I know it's primarily for salesmen, but I got a lot of good out of it as a company president."

T. H. Golson of Montgomery, Ala., covering that territory for Wesson Oil & Snowdrift Company, said the Birmingham meeting covered "good, sound fundamentals . . . it brought back some of the things we might have known but have quit using . . . and it gives us something to think about besides price."

Other comments from the opener in Birmingham and other meetings: Joseph Stobaugh, Southern Cotton Oil Company, Little Rock, Ark., said: "Most rewarding to our group. It reminded us of some places we may have slipped in our selling, and it shows the need of stressing product quality." Albert D. Graham, president of A. D. Graham & Co., Somerset, Pa., said: "Very worth while. If the meeting is held again, all my salesmen will attend at my personal expense." William Angstadt, Reading Bone Fertilizer Company, Reading, Pa., said: " . . . might revolutionize the fertilizer industry as far as marketing and merchandising is concerned."

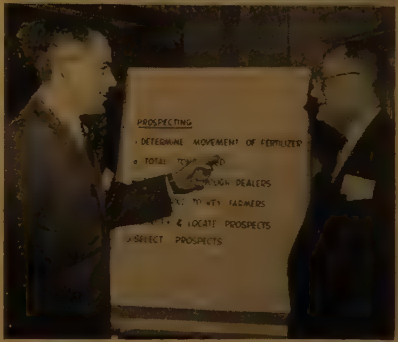
Archie T. Edwards, Red Star Fertilizer, Sulphur Springs, Texas, said: " . . . pleasantly surprised by the number of good ideas and principles covered." R. G. Dozier, Dawson Cotton Oil Company, Dawson, Ga., said: "Educational and constructive . . . got a lot out of it."

The "Full Orbit" customer service program was launched last year by IMC to help fertilizer manufacturers sell more of the products. The service started last summer with distribution by IMC representatives of six manuals of value to the fertilizer industry. These covered advertising, building a sales staff, market analysis, dealer meetings, transportation, and technical service. Two new manuals—on insurance and use of credit—have been added for the "second stage."

IMC scheduled the regional training meetings after manufacturers requested more specific help in that area. Companies came from distances of more than 300 miles to attend the sessions, which were moderated by Neal Schenet, IMC's manager of merchandising. The full program listed meetings in Birmingham, Ala.; Shreveport, La.; Tampa, Fla.; Columbia, S. C.; Baltimore, Md. (two meetings); Cincinnati, Ohio; Des Moines, Iowa, and at IMC headquarters in Skokie, Illinois.

Fertilizer salesmen note selling tips at the Birmingham meeting. (l. to r.) Clyde Wyatt, Sylacauga Fertilizer Co., Sylacauga, Ala.; Herman Young and Jack Smith, C. O. Davis Guano Co., Moultrie, Ga.; and R. G. Dozier, Dawson Cotton Oil Co., Dawson, Ga.

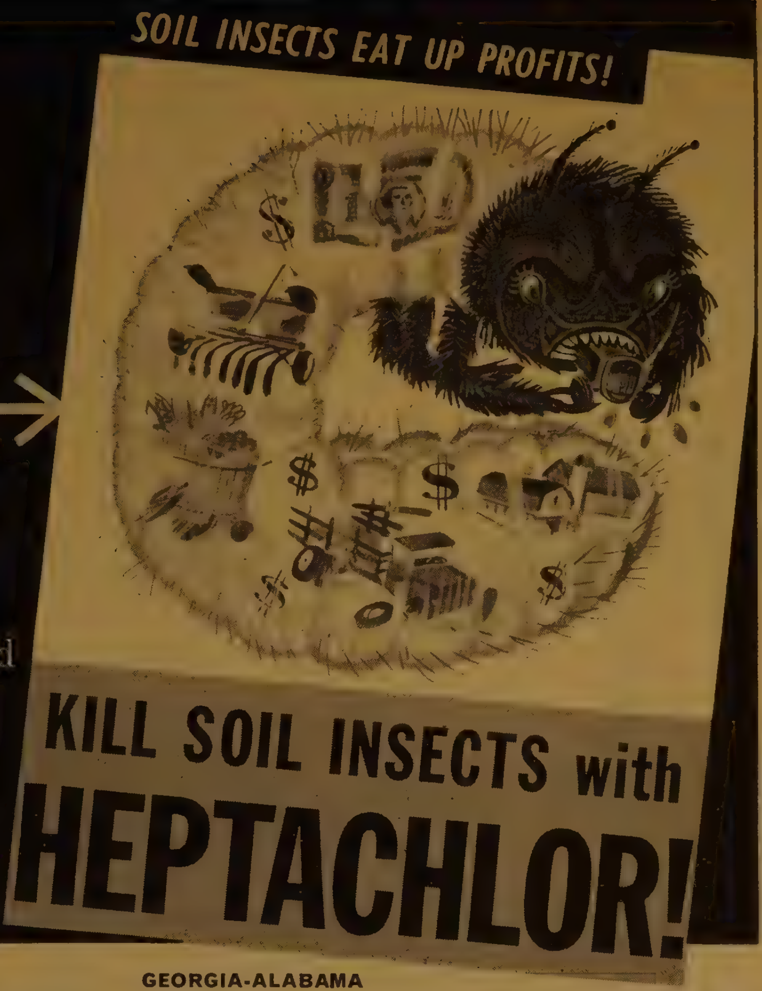
T. V. Hough (right) of Kershaw Oil Mill, Kershaw, S. C., goes over latest sales methods and services in the fertilizer industry with Milton Malone of Atlanta, Ga., office of IMC.



M. C. Morton (right) of Central Chemical Corp., Hagerstown, Md., and Basil Surgent of New York office of International Minerals & Chemical Corporation, review the spade work necessary in prospecting for customers.

HEPTACHLOR SOIL INSECT SELLING THEME for 1959!

HERE'S THE 1959 HEPTACHLOR SOIL INSECT PROGRAM . . . a series of regional campaigns designed to help HEPTACHLOR formulators, distributors and dealers from coast to coast!



WESTERN STATES
INSECTS: wireworms, root maggots, strawberry root weevils, flea beetles, clover root weevils
CROPS: vegetables, corn, potatoes, berries, other crops
TIMING: March & April

CORN BELT STATES
INSECTS: corn rootworms, wireworms, cutworms, white grubs, seed corn maggots, Japanese beetle larvae, root weevils
CROPS: corn, potatoes, vegetables, other crops
TIMING: March, April, May

KENTUCKY
INSECTS: wireworms, mole crickets, seed corn maggots, tobacco webworms, green June beetles, cutworms
CROP: tobacco
TIMING: April & May

EASTERN STATES
INSECTS: wireworms, white grubs, European Chafers, rootworms, Colorado potato beetles, flea beetles
CROP: potatoes
TIMING: January through April

SOUTH CENTRAL STATES
INSECTS: Rough headed corn stalk beetle
CROP: corn
TIMING: March & April

GEORGIA-ALABAMA
INSECTS: wireworms, southern corn rootworms, white fringed beetle larvae, Colorado potato beetles
CROP: potatoes
TIMING: January and February

INSECTS: white grubs
CROP: peanuts
TIMING: March and April

THE CAROLINAS
INSECTS: thrips, southern corn rootworms
CROP: peanuts
TIMING: April, May

INSECTS: wireworms, cutworms, flea beetle larvae
CROP: tobacco
TIMING: March

INSECTS: wireworms, southern corn rootworms, white grubs
CROP: corn
TIMING: February

FLORIDA
INSECTS: wireworms, cutworms, white grubs, white fringed beetles, mole crickets, rootworms, flea beetles, ants
CROPS: sweet corn, tomatoes, potatoes, melons, vegetables, other crops
TIMING: September through December

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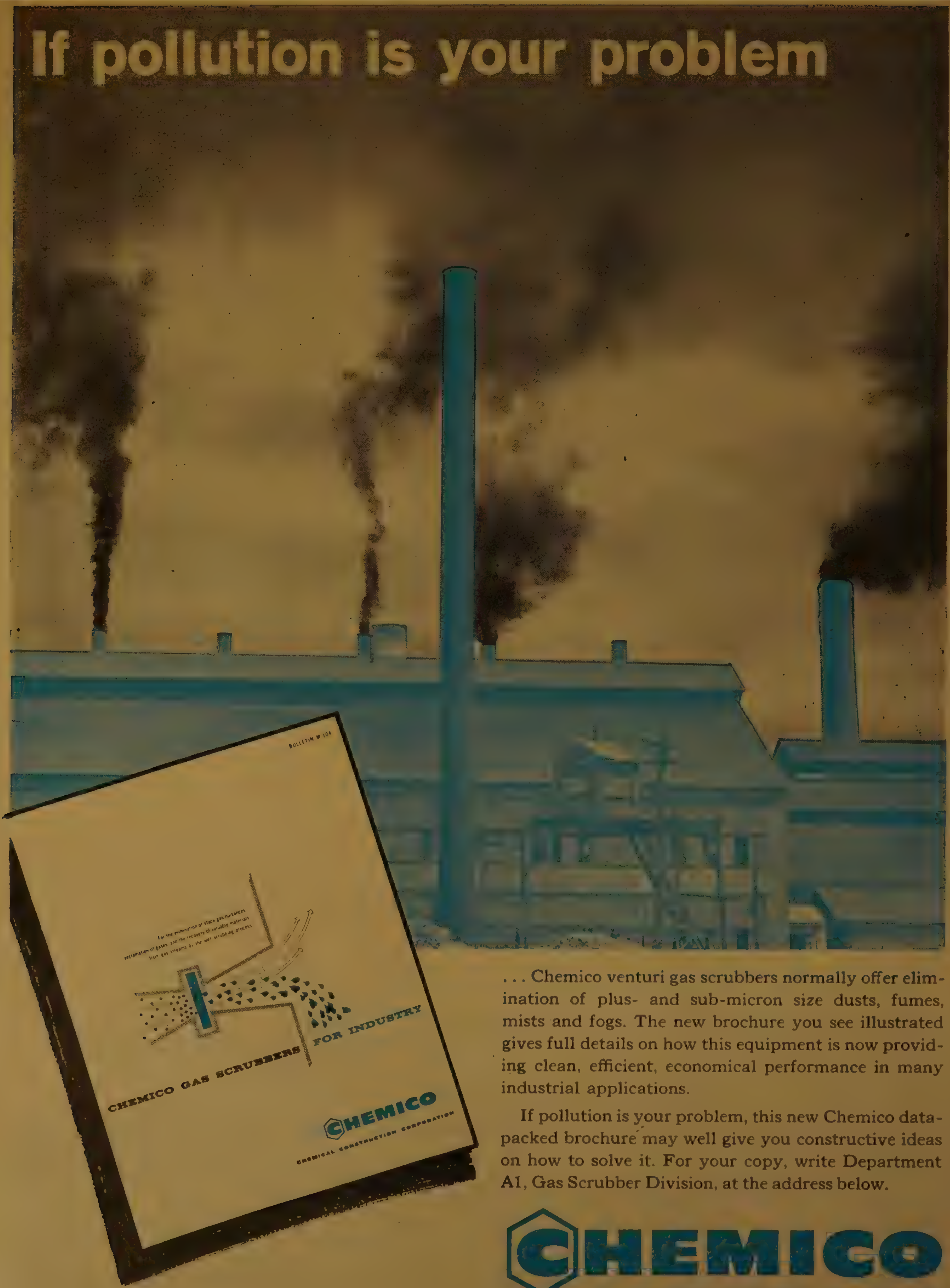
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Co-op improves plant efficiency with new tractor shovel operation

IN an effort to increase the efficiency of a fertilizer plant, Ed Shores, plant manager of the Growers Fertilizer Co-operative, Lake Alfred, Fla., last year sought to improve the plant's tractor shovel operations.

Bulk materials arrive at the plant by rail and are stored in 13 500-ton bins, 15 200-ton bins, and ten 40-ton bins. As the material is needed, it is fed into hoppers by tractor shovels and then is moved on conveyors through all phases of mixing and finally loaded directly to trucks for distribution. A dozen men can regulate the flow of 50,000 tons of 700 different grades of fertilizer in a 25-week period at the Growers plant.

Improvement in the already efficient operation would have to be in the tractor shovel phase of the flow. A point in favor of modernizing this phase was that the plant's four 15-cubic-foot capacity tractor shovels were due to be replaced anyhow. The problem was whether the size of the tractor shovels could be increased without making them too large to pass through the aisles and in and out of box cars.

Also, Mr. Shores was anxious to have tractor shovels with power-shift transmission. He felt that an operator's production fell off toward the end of each work shift because of the constant clutching and declutching. A local tractor-shovel distributor, the Linder Industrial Machine Co., had available the Michigan Model 12B tractor shovel that is equipped with the power shift. It is rated at 16 cubic feet, but that would accommodate only another 100 pounds or so over the plant's old 15-foot capacity models.

Since fertilizer is a relatively lightweight material — the heaviest that Growers was handling weighs 110 pounds per cubic foot — Mr. Shores reasoned that the standard machine could be equipped with a larger bucket.

The Model 12B has a lifting capacity of 3,000 pounds and its regular 16-cubic-foot bucket carries only 1,760 pounds of fertilizer. Mr. Shores' measurements of the Growers' plant indicated that a tractor shovel equipped with a ¾ cubic yard bucket would still fit in the aisles and through a box car doorway. The larger bucket is only four inches wider than the standard bucket and increases the machine's turning radius by only a few inches.

The ¾ yard bucket, however, increases the load by about 500 pounds, to a total of 2,230 pounds. This leaves a 700 pound safety margin. Even if the material is damp or heaps a little higher than usual, the tractor can still carry it safely.

During a three-day demonstration of the machines, they were tested under actual job conditions at the Growers plant. One Model 12B unloaded a 40-ton box car in 1½ hours — at least 15 per cent faster than one of the old machines. When feeding a hopper from a stockpile 40 feet away, the 12B dumped in 77 tons of fertilizer in 50 minutes. The 12B also negotiated 20 degree ramps, up or down, loaded or empty, without any trouble.

With the reduction in fatigue because of the power-shift, each operator was able to make more trips in a day. As a result, the plant ordered only three new Michigans to replace the four old machines. The elimination of one tractor shovel operator resulted in a saving of 15 per cent.

In addition, Mr. Shores reports that the 54-inch wide bucket protects the machine's tire side walls (over-all tire width is 48 inches) to reduce tire costs.

MCA Safety Data Sheet

Safe handling practices for phosphorus pentasulfide are described in a new safety data sheet issued by the Manufacturing Chemists' Association, Washington, D. C.

1958 has been a year of healthy consolidation. The generally lower level of new business we have had in common with most capital goods companies has given us a much needed opportunity to examine all our operations with the emphasis on sharpening efficiencies and stepping up the rate of our technological advance. In both, we have made substantial gains.

The sharpening of efficiencies is evidenced by a number of changes. Our manufacturing costs and delivery times are both noticeably better. A reorganization of our Research & Development group has resulted in a greater emphasis on basic research and a speeding up of development of new processes and equipment. This will ultimately include more and better manpower in both these areas. We have simplified routines, eliminated many nonessential operations and projects which seem to creep in during boom times. This allows us to proceed with less staff, but a more able and experienced one.

The current lag in new business has been much less noticeable overseas, and we have been concerned with a number of very large and significant projects abroad. Our subsidiaries have continued to progress and are contributing substantially to the financial balance of our consolidated effort.

PULP AND PAPER — A Canadian pulp producer will install a complete D-O Bleach Plant, and Bleach Washers will be utilized in expansion of an Indian groundwood mill. Late in the year Brownstock Washing and Recausticizing Systems, Deckers and hypochlorite preparation equipment were ordered for a new French mill. At a second French mill, a large Brownstock Washing System was put into operation in 1958.

Recausticizing Systems will be installed at two other new mills, one producing paper in India and the other linerboard in the western United States. Continued evidence of widespread acceptance of the American Disc Filter has been demonstrated by the number of orders entered for this efficient saveall. Also of interest were filters ordered for local manufacture from our Australian subsidiary and our Japanese representative.

FOOD PRODUCTS — In the citrus industry, Merco Centrifuges and Mercone Screening Centrifuges have been applied to the finish-processing of orange juice prior to concentration. Successful also has been application of the Centrifuge-Precoat Filter combination to apple juice processing.

Corn starch washing systems consisting of various combinations of centrifugal equipment were ordered for mills in the United States, Colombia, Holland and Mexico. And, as in so many previous years, the sale of RapiDorr Clarifiers and O-C Filters for cane sugar processing has contributed heavily to orders entered.

FLUOSOLIDS SYSTEMS — Applications of the FluoSolids system were broadened in 1958 to include heat treatment or drying of such materials as foundry sand, phosphate base food products and concentrated detergent and for carbon reactivation. Another new application will be partial roasting of sulfide concentrates at one of Canada's largest smelters.

Other FluoSolids projects now in the design stage or under construction are slag dryers for India and Alabama; pyrite roasters for Spain, South Africa and California; a coal dryer for a midwestern producer and two-stage arseno-pyrite roasters for installation in the gold fields of northern Canada. Now in operation or under construction around the free world are over 100 FluoSolids installations on such proven applications as sulfide ore roasting, coal and slag drying, and limestone and phosphate rock calcination.

PLANT ENGINEERING—The year's major project was the design of a 150 metric ton per day triple superphosphate plant for Mexico. This large contract includes process engineering, plant design, purchase of equipment and supervision of construction of the granular fertilizer plant as well as attendant facilities such as labs, cafeteria, offices and guest house.

A second substantial current project, which is being carried out jointly by D-O and one of our subsidiary companies in Europe, is the design of a large Yugoslavian copper concentrator. Also engineered abroad were a Belgian dicalcium phosphate plant and the expansion of a German phosphoric acid plant. During the year a large fertilizer installation in England went into operation and was rapidly brought up to operating capacity. A fertilizer plant in Montana and a copper concentrator in Israel, both D-O designed, were put into operation late in the year.

Latest addition to the list of installations which the company can now design is the board plant. We are staffed and equipped to engineer any of the basic types including wet or dry process hardboard and particle, insulating, gypsum and flake board.

CHEMICAL—In 1958 new developments highlighted Dorr-Oliver activity in the far-flung chemical industry. Among the foremost of these was the plastic Filter, a rotary drum vacuum unit constructed of plastic with glass fiber reinforcing. Initial orders indicate the applicability and economy of this unit for mildly corrosive applications.

A second major development, the Merco H-30 Centrifuge, provides the chemical industry with a high capacity, high speed unit capable of clarifying up to 600 gallons of slurry per minute. The product of nearly four years of testing, this machine has substantially reduced operating power requirements per gallon of feed. One of the first commercial applications will be crystal separation at 90° below zero.

Result of yet another new design program is the expanded line of Type L centrifugal pumps. Here, three new designs provide increased capacity and head range and reverse inlet flow for operating speeds of both 1750 and 3500 rpm. In addition, Hypalon elastomer lining is now standard for both Olivite and ODS Pumps.

During the year a German manufacturer ordered the eighth and ninth Horizontal Filters for dewatering artificial resins, and domestic producers purchased Horizontals for such applications as washing ammonium sulfate and nitrocellulose and filtering potash and copperas. Also in the potash field was use of the DSM Screen for debrining crystallizer underflow.

WATER — Here also new construction and plant expansions resulted in application of a variety of D-O pre-treatment equipment. Two large Hydro-Treator mechanisms will supplement four additional units already in operation at Miami, Florida, and Topeka, Kansas will utilize Presedimentation Clarifiers and Flocculators. PeriFilter systems will be installed at Peoria, Illinois and Leander, Texas, and in Mexico City the first PeriFilter of a new, simplified control design is now going into operation.

Not the least of our gains in efficiency has resulted from new and vastly improved headquarters facilities both here and abroad. Our new International Headquarters was completed here in Stamford in July, the staff of D-O NV expects to move into its own new office building in Amsterdam shortly, and our associates in both Brussels and Paris are enjoying new and excellent facilities in co-operatively owned buildings.

In every respect, we are better prepared than ever before to take advantage of the upswing to come and to give better service to our customers throughout the world. This betterment, of course, could only have come about by the diligent and co-operative efforts of our total staff, and to them belongs the credit for the work done.

J. D. Hitch, Jr.
President

November 5, 1958

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LISTENING POST

By Paul Miller

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Mycology and Plant Disease Reporting Section, Plant Protection Research Branch, United States Department of Agriculture, Beltsville, Maryland.

New Fungicides For The Control Of Blackspot On Roses

T. J. HENNEBERRY, of the Entomology Research Division, and R. V. Travis, of the Crops Research Division, United States Department of Agriculture, Agricultural Research Service, tested the effectiveness of several new fungicides used in combination sprays with miticides for control of blackspot (caused by the fungus *Diplocarpon rosae*) on outdoor roses, in experiments at Beltsville, Maryland, in 1957.*

Methods:

Four blocks, each containing 11 plots, were used for the experiment. There was a 4-foot space between plots. Each plot contained three plants of the variety Helen Traubel and three of Red Radiance, or six plants in all, planted 2½ feet apart. A sawdust mulch one to two inches thick was used. Fertilizer applications and periodic irrigations kept the plants in good growing condition all through the season.

In the tests, the fungicides Phaltan (*n*-trichloromethylthiophthalimide), Cyprex (*n*-dodecylguanidine acetate), Agri-mycin 500 (streptomycin 67 ppm, copper 800 ppm, oxytetracycline 6.7 ppm), and zineb (zinc ethylene bisdithiocarbamate) were combined with the miticides Aramite and Malathion; also Pfizer P-189 and Anisomycin were used in combination with Aramite.

Concentrations of the materials used in the various miticide-fungicide combinations were: Aramite 15 per cent, Malathion 25 per cent, Zineb 65 per cent, Cyprex 70 per cent, Phaltan 50 per cent, and Agri-mycin 500, each used at the rate of two pounds of wettable powder in 100 gallons of spray. P-189 and Anisomycin were added in solution to give a concentration of 50 ppm. All sprays, including the check spray, also contained DDT one pound, Lindane ½ pound, and Santomerse, a wetting agent, ½ pint, per 100 gallons. Application was with a 2-gallon compressed-air sprayer at 60 pounds per square inch.

Sprays were applied weekly from July 17 until September 17. When the treatments began, the plants were severely infected with blackspot. Plants were rated for blackspot infection on August 29, after the seventh spray, and on October 9, three weeks after the last spray.

Results:

Table 1 gives results. The authors state that at the time of the first disease rating, on August 29, blackspot infection was from 42 to 60 per cent lower in the plots sprayed with Phaltan, Cyprex, and zineb than in the check plots. On the other hand, P-189, Anisomycin, and Agri-mycin 500 showed poor control at both ratings. On October 9 blackspot infection in the Phaltan and Cyprex plots was more than 65 per cent lower than in the check plots. Effectiveness of both Phaltan and Cyprex was significantly greater than that of zineb, perhaps because residual action lasted longer.

Phaltan and Cyprex were compatible with both Aramite and Malathion. Neither spray injury nor reduction in miticidal effectiveness resulted from the combination sprays, according to the authors. A possible disadvantage, however, is that the conspicuous white residues deposited on the foliage by both materials might be objectionable on ornamental plants.

Table 1.—Per cent of foliage infected with blackspot on rose plots treated with a miticide and fungicide combination spray. (Table from Henneberry and Travis, see footnote*.)

Treatment	Aug. 29	Oct. 29
Aramite plus—		
Phaltan	53	29
Cyprex	53	30
Agri-mycin 500	88	80
Zineb	53	50
Pfizer P-189	93	98
Anisomycin	98	98
Malathion plus—		
Phaltan	45	30
Cyprex	40	33
Agri-mycin 500	88	83
Zineb	58	57
Check	100	100
ISD 5 per cent	17	11

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* T. J. Henneberry and R. V. Travis, "New fungicides for the control of blackspot on roses," *Plant Disease Reporter*, vol. 42, no. 11, pages 1297-1298. Nov. 15, 1958.

Prevention of Antibiotic Injury with Na-K-Chlorophyllin

PETER A. Ark and James P. Thompson of the University of California reported results of tests confirming the effectiveness of Na-K-chlorophyllin for preventing injury to plants from antibiotics used in sprays.*

They sprayed greenhouse-grown Pinto beans and Marketer cucumbers with appropriate concentrations of Acti-dione, aureomycin, patulin, streptomycin sulfate, and Terramycin, in aqueous solution. To the sprays for one set, 1 per cent of Na-K-chlorophyllin was added. On the other set, the antibiotics were used alone. After they were sprayed the plants were put in a location with strong light, which is known to favor expression of symptoms of antibiotic injury.

Results:

Pronounced mottling and symptoms of mosaic type were evident after three days on both beans and cucumbers sprayed with Acti-dione at 25 ppm. Plants sprayed with patulin at 100 ppm developed necrosis. Plants sprayed with aureomycin at 500 ppm, streptomycin at 1000 ppm, and Terramycin at 500 ppm manifested various degrees of chlorosis.

Plants that were sprayed with the same antibiotics used at the same concentrations but combined with one per cent Na-K-chlorophyllin showed no injury. Only partial protection from injury was afforded by the addition of 0.2 per cent Na-K-chlorophyllin to the antibiotic sprays.

The experimental plants used apparently were susceptible to injury from antibiotics at high concentrations, according to the authors, and Na-K-chlorophyllin gave full protection at the one per cent level, but did not prevent injury when used at lower concentrations.

The authors conclude that since Na-K-chlorophyllin is not a pure substance, the anti-injury factor in it is probably present in rather low concentration. Equal protection against both necrotic and chlorotic types of injury suggests that the anti-injury factor is not specific★★.

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* Peter A. Ark and James P. Thompson, "Prevention of antibiotic injury with Na-K-chlorophyllin," *Plant Disease Reporter*, vol. 42, No. 11, pages 1203-1205, Nov. 15, 1958.

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G. Utter Elected NEWCC President to Succeed S. N. Fertig —

S. N. Fertig (left) congratulates L. G. Utter after election.

THE 13th annual meeting of the Northeastern Weed Control Conference was held at the Hotel New Yorker, New York City, January 7-9, with over 600 members of the industry as well as government personnel and herbicide applicators present to evaluate the research findings of the past year, as presented in a program of over 100 papers.

L. G. Utter, Diamond Alkali Co., Painesville, O., was elected president at the annual business session, to succeed S. N. Fertig, Cornell University. E. M. Rahn, University of Delaware, was elected vice-president; and D. A. Shallock, Rutgers University, was re-elected secretary-treasurer. It was announced that the 1960 meeting would again be held at the Hotel New Yorker, January 6,7,8.

A feature of the '59 meeting was a series of discussions on the role of herbicides in conservation and public health, apparently designed to answer the critics of pesticide spray programs who often express blind opposition to such projects without realizing the important role they have in protecting public health and our natural resources. In this series, Justin W. Leonard, asst. deputy director, Michigan Department of Conservation, took as his topic, "The Use of Herbicides in Conservation." He emphasized that "conservation agencies recognize herbicides as a valuable tool in the management of renewable natural resources." Herbicides are very useful in game management, he pointed out, and can be employed to permit manipulation of environment to encourage growth of game populations. Control of aquatic weeds is also important in fisheries management, he emphasized. Weed control can be employed to build fish populations, to favor development of larger fish and to make lakes more accessible to sportsmen.

Reminding that conservation agencies themselves are not immune to public criticism, when they employ herbicides, he observed that there is a tendency on the part of the public to confuse herbicides with more toxic pesticides and to damn indiscriminately everything that might fit under the pesticide label. The greatest obstacle to the use of herbicides in chemical debarking, he said, (one of their major uses in forest management), has been "the perverse refusal of most field crews to follow even the most basic and rudimentary instructions as regards application technique." He referred also, in critical tone, to the injudicious use of hormone-type herbicides along highway rights-of-way. "Operators seem inclined to keep the valve open all the way down the road, dosing individual trees and shrubs which might better be left intact, or perhaps even worse, hitting vegetation a glancing 'lick' which results, not in a clean kill, but in an eyesore which offends the public, yet does not achieve the desired control."

In another paper by W. R. Byrnes and R. J. Hutnik of Pennsylvania State University, a detailed report was presented which indicated a favorable effect of chemical brush control on game and wildlife populations. Deer, rabbits, grouse, squirrel and turkeys were observed in all treated areas. Deer and rabbits used the unsprayed control areas more heavily than they did the chemically treated areas, but in general, the population of deer and rabbits increased in all treatment areas.

As is normal each year, there was considerable attention given in this year's Conference Program to a series of promising new herbicides. A. J. Tafuro, research specialist, AmChem Products, Inc., Ambler, Pa., reported on "Development of Four New Herbicides." They include two new benzoic acid derivatives, (Dinoben and Amoben), a new liquid formulation of 3-amino-1,2,4-triazole, (Amitrol) and formulations of 2,3,6-trichlorophenylacetic acid (Fenac-S), the water-soluble sodium salt, and (Fenac-WP), a wettable powder of the amide. Dinoben and Amoben, he reported, show promise for pre-emergence control of weeds in various vegetable and field crops and on crabgrass in turf. Amoben is of

Top photo: C. Hovey, chairman Awards Committee, presents award of merit to Paul A. Lutz, county agent, Schenectady, N. Y. Lower photo: Max Kirkland, farm-radio-TV editor, Rutgers, Univ. is shown recording a tape by Dr. E. R. Marshall of Carbide & Carbon Chemical Co.

particular interest for use on soybeans. Amitrol appears to be a superior material for quackgrass control. Fenac-S and Fenac-WP were discovered by Hooker Chemical Corp., and are being developed cooperatively by Hooker and AmChem. They have produced outstanding pre-emergence control of crabgrass in turf, Mr. Tafuro reported, and look promising for controlling bindweed and quackgrass, as well as for soil sterilization.

In another paper dealing exclusively with the subject of "New Chemicals for Pre-emergence Crabgrass Control," John A. Gallagher and Richard J. Otten, AmChem Products, reported that of all the materials tested Fenac-S and Fenac-WP "were the most promising." Single applications of 3 pounds per acre produced 85% crabgrass control with no turf injury, while 6 lbs. per acre gave 97% control with only slight temporary turf discoloration.

T. R. Flanagan, asst. agronomist, University of Vermont, reported on "Six Years of Spraying for Weed and Insect Control in Vermont." Since 1952, when only 30 low-pressure, low-volume sprayers were in use, the number had increased to 212 sprayers in 1958. In addition, about 13 commercial custom operators are active in the state. To this total must be added half a dozen aircraft spraying brush and doing insect control work on contract. Over 70 of the farmers owning weed sprayers also do custom work.

In 1953, about 39 acres were sprayed on average by each operator; in 1958 the state average had increased to 58 acres of weed and insect control per spray rig. To give impetus to the state-wide spray program, considerable use is made of publicity in newspapers, on radio, TV, etc. A periodic weed spray bulletin, "Spray Tips", is distributed to county agents, and Weed Control Recommendation Charts are widely distributed.

An excellent, practical paper presenting considerable general in-

(*Continued on Page* 115)

Thumbnail Summaries of Herbicides Research

- Studies at Ste. Clothilde de Chateauguay, Quebec, Canada, indicate that MCPB is a safe herbicide for use on certain varieties of peas such as Perfection W.R., Cansweet, Pride, Wisconsin Early Sweet or Green Giant S.5.39 at rates of 16 to 20 oz. per acre. The herbicide should be applied when the peas are 4 to 5 inches tall.

- Eptam was found to be effective in controlling nutgrass and established quackgrass in addition to many annual grassy and broadleaved weeds in horticultural and agronomic crops. Rates of 3 to 4 lbs./acre are adequate when thorough soil incorporation is effected.

- Simazine and Neburon gave effective weed control on raspberries, with no injury. On strawberries, a single application of Neburon on vermiculite at 6 lbs./acre gave good weed control for 6 weeks with no injury—was more injurious as a spray.

- For weed control in sweet corn, amino triazole, ¾ lb./acre, and DNBP amine, 3 lbs./acre, applied when corn was about 2 inches high, gave good control of annual grasses and broadleaf weeds, when followed by tractor cultivation. No significant effect was noted on plant stand or yield. Emid, 2 lbs./acre, applied just after seeding, gave equally good control.

- For control of nutgrass and crabgrass on potatoes and tomatoes in Delaware, the only herbicide that gave satisfactory weed control with no plant injury or yield reduction was granular EPTC. At 10 lbs./acre nearly perfect control was obtained, while at 5 lbs./acre, adequate commercial control resulted.

- Of the newer herbicides tested in New York State for control of weeds in tomatoes Niagara Experimental 4512 appears to offer most promise as a post-emergence spray. Granular formulations continue to exhibit superior performance over conventional liquid sprays in crop safety and ease of application.

- In studies in New Jersey, granular formulations of EPTC, CIPC, Dinoben, Simazin and Neburon, and aqueous sprays of EPTC provided satisfactory weed control in tomato plots with no reduction in yield.

- For weeding carrots in New York State, Chloro IPC, Vegadex, EPTAM and the new ACP 460 Dinoben showed excellent promise in pre-emergence or at-planting applications. For post-emergence application, the new products, Niagara No. 4512 and No. 4562, appear to be serious competitors for the place held up to now by Stoddard Solvent, except where barnyard grass is a problem.

- For pre-emergence weed control in corn, Simazine was called outstanding for the control of broadleaves and grasses throughout the entire growing season by another investigator (Delaware). A rate of 2 lbs./acre in moist soil proved to be more effective than a rate of 4 lbs./acre in a season of less favorable moisture conditions.

- For control of grass and broadleaf weeds in field corn, Simazine, 2,4-D Amide, 2,4-D LVE, CDAA plus TBA and CDAA-T all gave satisfactory control with no reduction in yield.

Additional Summaries to Appear in March

Horn Fly Control with Bayer 21/199

By **Harold G. Alford** and **C. M. Jones**
Entomology Research Division, USDA

THE effectiveness of dermal applications of Bayer 21/199 in controlling the first larvae of the common cattle grub, *Hypoderma lineatum* (De Vill.), was first reported by Brundrett *et al.* (1957). In another report (Brundrett *et al.* 1958) they showed that this insecticide is also toxic to horn flies, *Siphona irritans* (L.).

During the summer of 1957, more than 5,000 beef cattle in central and northwestern Nebraska were sprayed with Bayer 21/199 to determine whether horn flies and both species of cattle grubs, *H. lineatum* and *bovis* (L.) could be controlled with the same application. This report describes the horn fly studies.

PROCEDURE

The cattle were located on 14 different ranches and were kept in large pastures. All ages ranging from calves a few weeks old to mature cows and bulls were included. Horn fly infestations were moderately heavy on all animals, ranging from approximately 200 per animal in nine herds to more than 500 per animal in six herds. All of the cattle on nine ranches received the same treatment, because it was not feasible to divide the herds into smaller groups. The spray applications were made between June 17 and August 16. Suspensions prepared from a 25-per cent wettable powder were applied with a 50-gallon power sprayer operated at a pressure of 250-350 pounds per square inch. Groups of 15 to 20 animals were placed in small pens and sprayed with an average of 2 quarts of material per animal.

Eight herds were sprayed with 0.25-per cent, seven with 0.5-per cent, and one with 0.75-per cent suspension of Bayer 21/199. A second application was made on two of the herds sprayed with the two lower concentrations when the initial treatments lost their effectiveness. Three herds were sprayed with 0.5-per cent methoxychlor for comparison. Some of the late-season observations were supplied by the owners of the cattle.

Horn fly infestations were observed before spraying and at intervals of 1 to 2 weeks thereafter until approximately 50 per cent of the animals in each herd had 50 or more flies each. Most of the cooperators did not consider that respraying was necessary until the animals had this number of 50 flies. Counts could not be made at predetermined frequency intervals because of the distance between ranches. The criterion of duration of effectiveness was the last observation which showed 50 or less flies per animal. In many cases, it is likely that the sprays were effective for a few days longer than indicated in Table 1. Observations were made by driving in a car or riding a horse through the pasture and checking individual animals. Field glasses were used when it was not possible to approach the cattle for close observations.

RESULTS

The results of these tests, given in Table 1, show there was considerable variability in the duration of effectiveness of both 0.25- and 0.5-per cent Bayer 21/199 sprays, at the same as well as, at

(*Continued on Page* 127)

Table 1. Effectiveness of Bayer 21/199 and methoxychlor sprays for the control of horn flies on cattle.

Treatment	Application and herd number	Number of animals	Spray date	Days effective
Bayer 21/199 0.25%				
	First			
	1	189	June 17	13
	2	334	19	9
	3	240	28	—[a]
	4	360	July 1	29[b]
	5	238	2	40
	6	638	5	38
	7	84	12	13
	8	432	23-24	17
	Second			
	1	189	July 12	21
	4	360	30	24
0.5%	First			
	9	568	June 18	—[a]
	10	422	21	34
	11	122	28	12
	12	300	July 9	36
	13	665	10	12
	14	235	Aug. 5	17
	15	69	16	14
	Second			
	9	568	July 3	35
	10	422	30	24
0.75%	16	320	July 1	53
Methoxychlor 0.5%	17	84	June 17	13
	18	44	July 2	40
	19	330	23	17

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[a] Herd reinfested 10 days after treatment.
[b] Treatment repeated although 90% of animals had less than 50 flies each.

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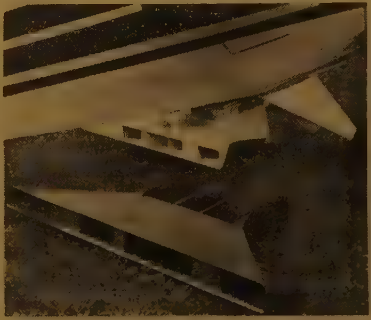

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THIS MONTH'S FEATURES

- CAAA Meeting Report
- Forest Management Silvicides and Methods for Application
- CallAir Agricultural Plane
- Indiana-Ohio Meeting Report

6:00 a. m.

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California

GROUP STUDIES PROBLEMS

First installment of a 2-part report.

THE California Agricultural Aircraft Association, held its 9th annual convention at the Senator Hotel in Sacramento, California, January 22nd to 24th. The opening session featured a legislative panel, with Robert Z. Rollins, Chief, Bureau of Chemistry of the California Department of Agriculture as one of the speakers. He pointed out the big growth in aerial application in the state and the new problems which are arising. A recent report by the Bureau of Chemistry on acreage treated noted that aerial application has grown from less than one million acres a year 10 years ago to over 5 million acres per year at the present time. One out of every two acres sprayed in California is now sprayed by air. The importance of the agricultural applicator is pointed up by the fact that two-thirds of all California acreage is treated by aerial and ground rig operators and only one-third by the farmers themselves.

Naturally, this rapid increase in aerial application has caused problems, and some complaints have been brought to the attention of the Department of Agriculture. These problems, if not solved by the aerial applicators, may result in future new legislation being enacted, he warned. Mr. Rollins pointed out the need for clarifying legislation on apprentice pilots and financial responsibility, and said that the Department has recommended new legislation in these areas.

The extension of housing subdivisions into agricultural areas has created new problems and restricted use of aircraft. Both aerial and ground rig applicators are a source of complaints from home owners because of drift of chemicals, and because of operations too close to schools. He urged opera-

James B. French (right) welcomes Col. Gregory (Pappy) Boyington, the featured banquet speaker. Below: John F. Neace urges operators to work together in CAAA and NATA.

James K. Vedder, CAAA president for 1959, is congratulated by James B. French (right), outgoing president. During Mr. French's two years in office, membership in the CAAA increased by 40 per cent.

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tors to keep away from schools during school hours. Other complaints coming to the Department of Agriculture deal with the problem of what to do with empty containers containing poisonous residues, the problem of adequate supervision of apprentices, complaints arising from use of excessive concentrations of pesticides causing spotting and burning of crops, excessive swath width resulting in poor control and the ever-present complaint of drift of chemicals onto feed and forage crops.

W. R. "Rem" Thigpen, special assistant to the president of United Air Lines, discussed legislative problems on aviation fuel taxes both at the state and federal level. He reviewed the history of the highway fuel tax by the state and federal government and its relation to aviation tax, pointing out that aviation fuel has been exempt from tax at the state level, although the state highway fuel tax is now six cents a gallon.

The federal fuel tax is now three cents a gallon, with a 1 cent exemption for aviation. Proposed new bill this year, if passed, would raise the aviation tax from two cents a gallon to 4½ cents. Mr. Thigpen feels that aerial applicators should be able to get exemptions from this new tax, if passed, because of their limited use of federal airway facilities. The proposed tax would add a tremendous expense to the operating costs of aerial applicators and he urged the association to energetically seek and demand exemptions because of the very few government benefits to the aerial applicating group. The government makes no subsidies to aerial applicators, underwrites no aircraft development program and guarantees no loans, as it does to other phases of aviation.

Clyde P. Barnett, Director, California Aeronautics Commission, discussed a subject which he said does not normally concern agricultural operators — the airspace problem. He explained that the Air Space Committee at the regional level and the Air Coordination Committee at the federal level are restricting air space drastically because of the demands of the military. 43 per cent of California air space is now restricted in some way. Due to the restricted space, along with the increase in aircraft, there has been a rapid rise in mid-air crashes.

Left to right are: Henry C. Moore, Ex-Officio, CAAA and president of Moore Aviation; Wanda Branstetter, Executive Secretary, CAAA; and Robert E. Monroe, Assistant Executive Director, NATA. Mr. Moore and Mr. Monroe spoke at the meeting.

Senator Stephen P. Teale discussed the communications which come into his office both from and concerning aerial applicators. He said that communications *from* aerial applicators at the present time are mainly about canceling the gas tax—and complaints *about* applicators are mainly about operations near schools. He said that restrictive legislation regarding aircraft operations near schools has been proposed, and advised operators strongly to keep away from schools and to get public relations work underway with school heads.

Another proposed piece of legislation which Senator Teale discussed was the Tall Towers Act proposed to prevent erection of structures hazardous to aerial operation.

Assemblyman Lloyd W. Lowrey also discussed possible new legislation that may be enacted and concentrated primarily, as did Mr. Barnett, on his concern about the problem of air space being continually diminished as the military takes over new installations.

Dr. Ralph Glasser, toxicologist with Shell Chemical Corp., New York, talked on the practical aspects of safe handling of pesticides. His discussion concentrated primarily on the Shell product, "Phosdrin," as an example of how a toxic material can be handled safely if instructions are followed. He urged applicators to read with great care the residue studies, toxicity studies and handling instructions on any toxic material.

He explained the safety tests employed by Shell in testing a new pesticide like Phosdrin. A test operator dusts with the material after having a series of gauze bandages attached to different parts of his body. After the test, the bandages are analyzed to determine which parts of the body are most vulnerable. The field tests on Phosdrin demonstrated that the principal danger areas are first, the hands, second, the thighs (because opera-

(*Continued on Page* 111)

Helicopter at left is equipped with an air borne mist blower that atomizes by either air velocity or direct pressure and has particle size control for herbicide application. Below, a six h.p. mist blower is mounted on a crawler tractor for forest application. Many thousands of acres will be treated by this method in 1959. Picture on Page 54 shows the all-around, useful back pack mist sprayer that reaches for a distance of 20 to 30 feet from the air nozzle.

The Use of Silvicides

THE use of selective chemicals has enabled foresters to thin areas and to favor one species of tree over another in the management of woodland plots. In recent years, however, the concentrated spray method of application, a development that permits foresters to cover both large and small areas quickly and economically, has greatly expanded the use of silvicides in forest management.

For example, as little as one to three quarts of 2,4,5-T ester can be used in two to three gallons of total spray per acre to effectively release conifers from aggressive, competing hardwoods of any size.

Although the use of silvicides in forestry is only in its infancy, the following uses already have been demonstrated: control of undesirable plant and tree species, as in the preparation of an area for planting; release of coniferous seedlings and trees (both natural and planted) that are being crowded out by undergrowth, hardwood sprouts, or overstory; and control of brush along power lines, trails, and roadways through forests.

Among the factors to be considered when planning an efficient silvicidal job are application equipment, methods, and cost. Also worthy of consideration are the composition of the growth to be cleared, what species are predominant, whether the area is accessible to spray equipment, and the size of the area. These factors will determine the cost.

To reduce costs and increase speed and ease of coverage, the applicator must consider the use of cheaper and more phytotoxic, selective chemicals and effective methods of using less total chemical per acre. Methods for using less diluent and total spray volume per acre and cheaper, lighter, and more mobile spray equipment also should be considered. An example of selecting the cheapest effective chemical for control of willows is the use of 2,4-D amine (which costs $2.70 per gallon) instead of 2,4,5-T (which costs $9 to $10 per gallon).

Kinds of Treatment

Application of silvicides may be classified as foliage, basal stem, and stump or stubble. Foliage application is the quickest and best adapted way to treat for the first time to convert growth to a relatively non-woody plant area. This method, however, is limited to seasonal operation. (This subject is discussed in detail in a book by the author entitled, "Concentrated Spray Equipment, Chemicals, and Application Methods," published by Dorland Books, Caldwell, N.J.)

Basal stem treatment is particularly useful to control sparse infestations that are inaccessible to

In Forest Management

by S. F. Potts

Potts Feed Mill & Gin Co.
Crawford, Miss.

other spray equipment, and for treating stems that survive foliage applications. Treatment can be made at any time, preferably during the dormant period without chance of injury to sensitive crops. This permits the use of manpower during the off-season and relatively inexpensive equipment is required. However, basal stem treatment is not as economical or as widely applicable as foliar sprays; and stems larger than two inches in diameter are difficult to kill.

To obtain desired results, it is important to apply sufficient liquid to assure physical run-down outside the stem to the root crown, bud, or transition zone of the plant. Knapsack or round back compressed air sprayers are more often used to apply the chemicals. A useful light power unit, however, consists of a four h.p. gas engine, ½ inch gear pump, and two lines of light hose with a suitable nozzle, gun, and shut off valve attached to each line of hose. The chemicals are used at five times the concentration of dilute sprays, that is 16 pounds 2,4,5-T acid or more per 100 gallons of No. 2 fuel or diesel oil, or one pint in two and one-half gallons of oil. As a marking aid, up to 60 per cent of the oil in the mixture can be supplied from strained black carbon waste oils of filling stations and garages. White strings also may be used to outline spraying lanes.

Stumps should be thoroughly wetted at time of cutting to reduce sprouting. Usually one man treats the stumps behind a regular cutting crew. Ammate may be applied as crystals at the rate of two ounces per six inches of stump diameter.

Foliage sprays are the third type of treatment. In these, the 2,4-D weed killers will control species such as willow, alder, sumac, elderberry, brambles, raspberry, and blackberry. The herbicide is not sufficiently effective, however, against most dominant hardwoods like oak, ash, hickory, persimmon, and maple. For these and most other resistant woody species like osage orange, 2,4,5-T is more effective than 2,4-D. A common mixture is one containing two pounds of 2,4,5-T and two pounds of 2,4-D acid equivalent per gallon. For the dilute or full dilution sprays, three to six quarts of 2,4-D — 2,4,5-T mixture is added to each 100 gallons of water for foliage application.

Dr. Potts, the author, recently left the U. S. Forest Service of the United States Department of Agriculture to devote full time to the Potts Feed Mill & Gin Co. He plans to manufacture two sizes of mist blower machines similar to those shown in the accompanying photos for the coming season.

Silvex or Kuron is more effective against a few species like scrub oak than 2,4,5-T, and amino triazole is more effective than other materials for thistles and poison ivy.

Ammate is applied to foliage at the rate of 75 pounds per 100 gallons of water. Thorough wetting with a spreader-sticker is important. Compared with most other silvicides, ammate is more expensive and is more corrosive on equipment, particularly copper and brass gears and pipes. Concentrations up to six pounds per gallon can be prepared for semi-concentrate applications. Ammate is nearly a "one shot" treatment because it effects an 80 per cent or better root kill of mixed species, making re-treatment unnecessary for several years.

Application Methods

Equipment ordinarily consists of a conventional piston type hydraulic sprayer with ¾ inch high pressure hose. Nozzle sizes fit the pump capacity, necessitating a big, heavy outfit when the orifice size is ¼ inch, or more.

Knapsack sprayers or compressed air back sprayers may be effectively used to apply four to ten gallons of finished spray concentrate per acre. This gives no spray drip and run-off and the low gallonage required enables a man to cover three to six acres per day. This system also is economical for spot spraying and for re-treatment of old sprayed areas. It is limited by the fact that it cannot reach growth higher than 12 to 15 feet. A most important item is a low

(Continued on Page 119)

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Texas Group To Meet February 23

PANELS on insect and brush and weed control will comprise the bulk of the discussions on the first day of the eighth annual Texas Agricultural Aviation Conference at Texas A & M College, College Station, Texas, February 23, and 24.

The entomology staff of Texas A & M will present the symposium on insect control, to be moderated by Dr. J. C. Gaines, who will discuss Public Law 518, the Miller Amendment. Dr. R. L. Hanna will cover cotton insect control, N. M. Randolph is scheduled to speak on forage insect control, and Dr. D. R. King will handle vegetable insect control. Also on the panel are Dr. J. R. Brazzel, Basic Research in Insect Control, and C. F. Garner, Problems in Insect Control.

In the afternoon session, Dr. Wayne G. McCulley, Texas Agricultural Experiment Station, will lead a symposium on brush and weed control and will outline a concept of vegetation control.

H. M. Elwell, research agronomist ARS, USDA, Stillwater, Okla., will discuss problems in the preparation of emulsion sprays for brush control. T. H. Silker, silviculturist with the Texas Forest Service and the Texas Agricultural Experiment Station, Kirbyville, Texas, will tell of hardwood control for pine release and forage production and Dr. R. A. Darrow, department of range and forestry, Texas A & M, will cover rangeland brush control. The aerial application of chemicals for the control of mesquite regrowth is the topic of a paper to be presented by C. H. Meadors Jr. and E. D. Robison of the Experiment Station at Spur, Texas.

Dr. O. E. Sperry will review bitterweed control in 1958 with aerial and ground equipment and C. C. Boykin will conclude the symposium with a report on the economics of plant control. Mr. Boykin is with the department of agricultural economics and sociology at Texas A&M.

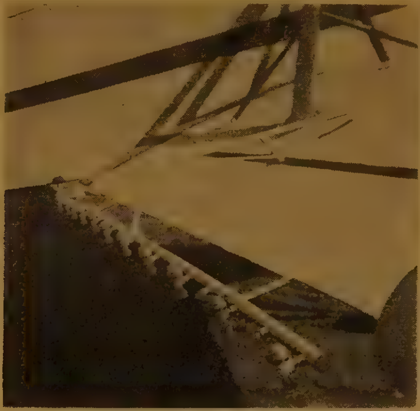
On Feb. 24, Dr. Aaron Rose, director of the engineering experiment station, Texas A&M, will be chairman of the morning session which is to include talks on aerial seeding and fertilizing and business management. Dr. D. R. Fitch of the Texas A&M business administration department will talk on the latter subject and Dr. L. E. Crane, superintendent of the Rice Pasture Experiment Station, Beaumont, Texas, will discuss aerial seeding and fertilizing.

Defoliants and dessicants are the subject of a paper to be presented by Dr. Wayne C. Hall, head of Texas A&M's department of plant physiology and pathology. Dr. Harlan E. Smith, plant pathologist with the Texas Agricultural Extension Service, will discuss disease control. The use of airplanes in government insect control programs will be reviewed by Arthur Geiser, Plant Pest Control Division, USDA.

The final afternoon of the conference will be devoted to field demonstrations of aircraft.

CallAir Planes Are Made Specifically For Applicators

From top to bottom, photos show: the spray boom on the trailing edge of the wing; the CallAir plane in flight; the cockpit featuring a large crash pad for pilot protection; and the hopper-tank and pilot side-by-side arrangement that is exclusive with the CallAir.



THE CallAir agricultural airplanes now are being produced without an internal boom arrangement because company engineers have found that better control of the spray is obtained with the boom on the trailing edge of the wing. Also taken into consideration was the impracticality of internal booms because if a leak occurs in the boom, the wing might be pumped full of chemicals.

The airplane was developed specifically for agricultural flying. Specialized equipment is required and the plane is built with an eye towards pilot safety at low altitudes and with heavy loads. A great deal of field research was carried out on the special problems of aerial applicators. CallAir, Inc., Afton, Wyoming, manufactures only agricultural airplanes.

The fuselage primary structure is made of 4130 chromoly steel and is designed in such a manner that it is overstrength for load carrying ability. It is specially designed around the cockpit area to give added protection to the pilot in the event of an accident. A turnover structure surrounds the cockpit and is designed to take the load from the engine mount up over the pilot's head and back into the fuselage so that the plane will not fold up on a pilot. The structure also supports the aircraft in turnovers and serves to deflect wires or any other objects away and over the pilot's head.

The hopper tank and pilot are located side by side on the plane's center of gravity. With this arrangement, there is no change of trim as the load runs out. In addition, the hopper will not add injury to the pilot in the event of an accident. The hopper tank is installed at the factory and is an integral part of the airplane.

Another standard feature of the CallAir planes is the loader's seat that accomodates a passenger immediately behind the pilot's seat, facing the rear.

The plane is built with a low wing configuration that is advantageous in turnarounds. It affords a full view of the point or a flagman. The company feels, in addition, that a low wing aircraft has a tendency to make better swaths

(*Continued on Page* 113)

Value of Demonstration, Economics of Application, Function of Applicator — Highlight Discussions at Indiana-Ohio Agricultural Aviation Conference

THE Indiana-Ohio Agricultural Aviation Conference was held at Purdue University, Lafayette, Ind., Jan. 21 and 22, starting with a dinner-business meeting.

The dinner was followed by a discussion on cooperation between the county agricultural agent and the applicator. G. T. Harris, county agricultural agent of Grant County, Ind., and Irvin Mount of Marion, Ind., led the discussion and emphasized the importance of letting the county agricultural agent know what the applicator can do and what his qualifications are. In other words, they explained, there should be a close relation and good public relations between them.

A panel on insect control problems followed this discussion and was led by M. Curtis Wilson of Purdue. Included on the panel were: C. A. Tripplehorn, Ohio; Robert E. Treece, Ohio; and Ray T. Everly, Purdue.

The Jan. 22 sessions were devoted almost entirely to airplane problems. Leon F. Hesser of the Purdue Agricultural Economics Department discussed aerial application as a business, covering the following four phases: the function of the applicator, services he should sell, analysis of cost returns in relation to application, and how to sell his service to the farmers. Mr. Hesser stressed the point that the applicator is a multi-purpose operator, functioning as a worker, manager, public relations man, businessman, and capitalist.

He pointed out that the farmer requests services, not to eliminate the pests, but to increase his income. The applicator has severe competition in the farmer applicator, himself. To meet competition, the applicator must know the cost-benefit relations of the different types of services he sells and must keep up with the technological changes.

A major factor in profitable operations is volume of business. Fixed costs are high and should be spread over as many acres as possible. Mr. Hesser said that costs per acre are more important than costs per hour. He used tables to explain how increased use of equipment reduced costs per hour and per acre. He also stressed the value of demonstration applications and exchange of information with professional farm managers. Attendance at conferences with research and extension specialists was recommended as a means of keeping abreast of new developments.

Mr. Hesser called attention to Bulletin 566 of the Oregon Agricultural Experiment Station, as a source of valuable information.

In the meeting's closing talk, Howard Taylor, Ohio Aeronautics Commission, also emphasized the value of education and public relations with vocational agricultural teachers and county agricultural agents. He said that close contact should be maintained with such persons, especially the county agents. Similar contacts also were recommended, such as luncheon clubs, agricultural classes, and adult farmer groups, to provide excellent outlets for information.

Mr. Taylor emphasized also the fact that a profitable business can not be developed on insect control alone. He said that the requirements for service from season to season are not consistent. Among other uses for the airplane suggested by Mr. Taylor were, applying fertilizer, herbide applications, and seeding.

The Indiana-Ohio Agricultural Aviation Conference was

(*Continued on Page* 113)

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Florida Group Holds Elections

The Horticultural Sprayman's Association of Florida, a trade group formed at Miami last year, has held its first annual election. Ted Kaylan, King Spray Service, was named president and William McAllister, Miami Lawns, is vice-president. The secretary is Gus Daye, Superior Nursery and Spray Service and Harold Hale, Southwest Garden Supply, is treasurer.

One of the accomplishments reported by the association last year was group sponsored, cooperative advertising, cautioning the public against false or misleading claims by spray men. The association includes in all advertising an association address and the phone number of a telephone answering service. The board of directors take monthly turns in receiving telephone calls. If the callers are asking for information about spray work, they are sent a list of the association members. If the caller has a complaint about spray work, the complaint is checked by the board member who makes a personal inspection of the work. On the occasions when legitimate complaints are found, the situation is brought to the attention of the membership at a monthly meeting, and necessary action is taken.

Officers of the Horticultural Spraymen's Assn. of Florida are: front row, left to right; Harold Hale; William McAllister; Ted Kaplan, president; and Gus Daye. Directors in the back row, left to right are: Robert Kuster, Florida Spray Co.; Charlie P. Johnson, Johnson Nursery and Spray Service; Henry Petri, Petri's Positive Pest Control; and Riley Prince, Riley Prince Exterminators. One other director, John Page, Busy Bee Exterminators, was not present.

PEST ROUNDUP

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head — Plant Pest Survey Section, Plant Pest Control Branch, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in the U.S.D.A.'s pest surveys throughout the U. S.

By Kelvin Dorward

Boll Weevil Hibernation Counts Below Last Year

RESULTS of the cooperative fall cotton boll weevil survey have been reported from North and South Carolina, Virginia and Louisiana areas. All areas show counts below those for the 1957 fall survey. In Louisiana, trash samples were collected in Madison, East Carroll and Tensas Parishes. Samples from Madison Parish had an average of 5,326 live weevils per acre. The average for East Carroll Parish was 9,845, and Tensas Parish 2,098 live weevils per acre. Average for the three parishes was 5,756. Similar records have been made in Madison Parish for 23 years beginning in the fall of 1936 and only in 1955 and 1957 were the counts higher in this parish. The 1955 count was 13,443 and in 1957 it was 6,860.

Woods trash samples taken in Orangeburg, Bamberg and Dorchester Counties, South Carolina, which has been designated as area 1 of the Carolinas and Virginia cotton boll weevil hibernation survey, had an average of 998 live weevils per acre as compared with 3,978 for 1957. Florence, Darlington and Marlboro Counties, South Carolina, and Scotland County, North Carolina, which comprise area 2, averaged 4,625 live weevils per acre. Area 3, composed of Anderson, Greenville and Spartanburg Counties, South Carolina, and Mecklenburg, Cleveland and Union Counties, North Carolina, averaged 2,635 live cotton boll weevils per acre as compared with 6,752 for the 1957 fall survey. The average found in the 1958 fall survey for area 4 comprised of Edgecombe, Franklin, Nash and Wilson Counties, North Carolina was 968 live weevils per acre as compared with 2,205 for 1957.

Live cotton boll weevils found in woods in area 5 which includes Brunswick, Mechlenburg, Nansemond and Southampton Counties, Virginia, averaged 511 per acre. This is considerably lower than the 3,335 average found for the same area in the fall of 1957.

Extensive finds of the pink bollworm in Maricopa and Pinal Counties, Arizona, since the first find in Maricopa County in July, have resulted in the Arizona Commission of Agriculture and Horticulture extending the state pink bollworm quarantine to include all cotton growing counties except Yuma and Yavapai. Although Cochise County was previously included in the quarantine, the first pink bollworm for the season in that county was found during November. This specimen was taken from gin trash at Willcox. During November, infestations were found on 106 properties totaling 7,321 acres in Maricopa County, and 10 properties totaling 1,800 acres in Pinal County, Arizona.

A survey in late November in the more heavily infested area of Dona Ana County, New Mexico, showed that low temperatures had caused a high mortality of pink bollworms in bolls on standing stalks. It was estimated that more than 90 per cent of the larvae were killed, with no live larvae in green bolls being found and very few in open bolls. In Oklahoma, approximately 60,000 acres of cotton were found infested for the first time. The first positive collections also were made in Cleburne and Mississippi Counties, Arkansas.

All survey work for the pink bollworm in California through the season was negative. The same was true for Alabama, Mississippi and Tennessee.

Cereal and Forage Insects

THE annual chinch bug survey in Arkansas showed a larger number of bugs in hibernation in the 17 counties surveyed than was found in the 1957 survey. Hibernation counts were rated as severe in 6 counties, compared with 3 last fall. Averages per square foot of hibernation area counted were as follows: Randolph County, 1,971; Poinsett, 1,825; Jackson, 1,125; Lawrence 1,606; Clay 1,746 and Cross, 1,924. The heaviest hibernation counts were in the northeastern part of the state. One county in Oklahoma was found to have a rating of very severe, 2,000 or more chinch bugs per square foot in hibernation. Severe ratings, 1,000 to 2,000 bugs per square foot, were recorded for Cleveland, Hughes, McClain, Okfuskee and Seminole Counties. Ratings in other Oklahoma counties surveyed were below the severe rating.

The greenbug was still being found during late fall and winter in several of the winter grain growing states. Infestations on fall-seeded oats in Arkansas were more common and heavier than in most

(Continued on Page 125)

Plan Mississippi Meeting

The annual meeting of the Mississippi Association of Aerial Applicators is scheduled to be held Feb. 13 and 14 on the Mississippi Gulf Coast. The exact site of the meeting had not been announced at press time.

•

Form Washington Association

A nucleus of 50 liquid fertilizer dealers operating in the state of Washington met at Pasco, Wash., on December 15 to form the Washington Liquid Fertilizer Dealers Association.

Officers of the organization are J. E. English, Moses Lake, president; C. L. Cummings, Walla Walla, vice president; Sherman McGregor, Hooper, secretary; and Lyle Neff, Pasco, treasurer. Other directors are John Thomas, Sunnyside; Edwin Andrus, Lacrosse; Warren Wilkinson, Ritzville; and Ray Witcomb, Grandview.

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Oregon Applicators Meet

The Oregon Agricultural Chemical Applicators Association held its eighth annual conference January 6 and 7 in Corvallis, Oregon, under the sponsorship of the Oregon Department of Agriculture and Oregon State College.

A panel on the properties of herbicides in relation to their use was comprised of Dr. Van Evans, soils department, Oregon State College; Don Burgoyne, Du Pont, San Francisco; Frank Crandall, Portland, Ore.; and Virgil Freed, associate chemist, Oregon State College.

W. R. Furtick, assistant agronomist O.S.C., moderated a panel on selective and perennial weed control, with the following taking part: Andrew Duncan, vegetable crop specialist, O.S.C.; Garvin Crabtree, horticulture department, O.S.C.; Richard Bullock, Northern Willamette Valley Experiment Station; W. Orvid Lee, A.R.S., U.S.D.A.; and Rex Warren, farm crops extension specialist, O.S.C.

Panels also were held to discuss soil sterilization, brush control, insect control, air safety, and forest insect and fire control. Carl E. Bond, associate professor, fish and game, O.S.C., spoke on aquatic weed control.

Examinations for state licenses for ground and air applicators were conducted at the meeting by Ray Kelso, herbicide control and weather modification supervisor for the Oregon Department of Agriculture. Mr. Kelso also took part in a demonstration at the meeting that pointed out the responsibility of operators to carefully control their spraying so as not to injure beneficial plants and animals.

•

Crop Dusting Pilot School

A flying school offering training in crop dusting as well as in regular flight instruction opened at the Douglas-Tahoe airport in Minden, Nevada, last month. The school is operated by the Turbo-Dynamics Corp. and is known as the Agricultural Aviation Institute.

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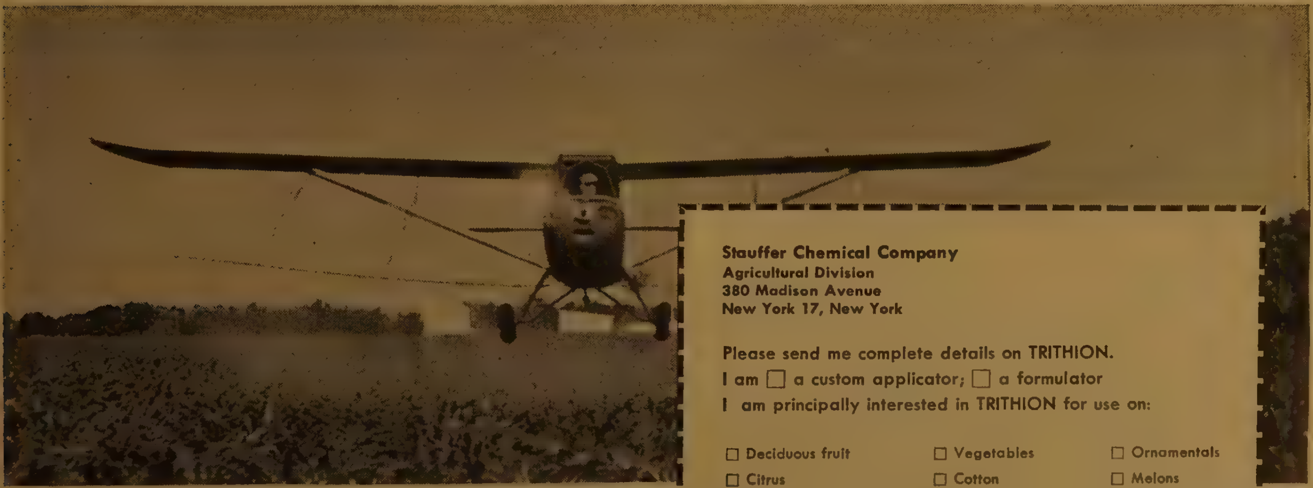

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WASHINGTON REPORT

By Donald Lerch

CONSIDERABLE publicity on pesticides and wildlife conservation may be anticipated during the next few months. For one thing, pesticides will be featured at the annual meetings of the National Wildlife Federation in New York, February 27, 28 and March 1, and at the 24th North American Wildlife Conference which follows in New York, March 2, 3 and 4.

Full-dress discussions of the subject will open meetings. The pesticides panel of the National Wildlife Federation will be in the Sheraton-McAlpin Hotel at 2:00 p.m. February 27. The discussion of pesticides at the North American Wildlife Conference will take place in the Statler-Hilton Hotel, Mar. 2.

An encouraging sign is that this time at least, both sides of the story will be presented, and we need not anticipate just one more biased indictment of insecticides on the part of those zealots who arbitrarily oppose their use. Experts who know the Industry and the benefits of chemical pest control will take part in both presentations. NAC's Executive Secretary L. S. Hitchner, L. F. Curl and Dr. Clarence Hoffman, of USDA, and Dr. Walter Dykstra of U. S. Fish and Wildlife Service, will take part in the Wildlife Federation's panel. The North American Wildlife Conference discussion will be chairmaned by Dr. George Decker, of the Illinois Natural History Survey.

But the negative side of the issue will be well aired, too. Panelists on the Wildlife Federation program will include Dr. M. M. Hargraves, who testified for the plaintiffs in the "DDT Trial" in Brooklyn last year, and Charles Kelley, of the Alabama Wildlife Federation, who has been critical of the imported fire ant eradication program. This panel will be moderated by Dr. Clarence Cottam, formerly of the U. S. Fish and Wildlife Service and now with the Welder Wildlife Foundation, Texas.

In the North American Wildlife Conference program Dr. Decker will be assisted by Dr. Frank Arant, of Alabama Polytechnic Institute, a critic of the fire ant eradication program. Others on the program include Harlow Mills and Norman Gannon, of the Illinois Natural History Survey; Robert Chisholm, of USDA; Dr. Daniel Leedy and Jerome Besser, of the U. S. Fish and Wildlife Service; Leslie R. Glasgow, of Louisiana State University; and Dr. Clarence M. Tarzwell, of the U. S. Public Health Service.

Topics on the two programs run the gamut from safety testing of pesticides to the pollution effects of organic insecticides. Conservationists feel that whatever else the programs might develop, they will provide the basis for conservationists' attitude toward the use of pesticides for some time to come.

Observers here feel that the conservationists' growing interest in pesticide applications offers the Industry an unparalleled opportunity. The time to step in with a hard-hitting information program is when interest is highest. If the challenge is met, the long term benefits to the Industry could be substantial.

Meantime, some conservationists in Washington are laying plans to oppose any new appropriations for aerial spraying by USDA in the imported fire ant control program. Instead, they will fight for more federal money to expand research to 1) determine the effect of pesticides on wildlife, and 2) develop new and "safer" means of insect control.

Washington observers discount the effectiveness of this campaign to halt or even seriously hamper the fire ant eradication program. Senator Herman E. Talmadge of Georgia, whose opinion is highly respected in Congress, is enthusiastically in favor of the program to eradicate the fire ant in his home state. Senator Talmadge's support will have its effect on other senators and Congressmen.

Even in Alabama, where conservationists have raised the loudest hue and cry against the eradication program, reports indicate surprising popular support for it. Every time conservationists attack the fire ant eradication program, a flood of new applications comes in from citizens who want to participate so they can get Government help in running the fire ants off their property.

* * * *

Battle lines are being formed to revise the nation's farm program. Regardless of the outcome, both fertilizer and pesticide manufacturers will be affected. For how the legislation is written will tend either to slow up or speed up farmers' use of agricultural chemicals.

Observers here see little

(*Continued on Page* 123)

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HELPS SOLVE YOUR TECHNICAL
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IMC personnel have worked with virtually every kind of equipment in the fertilizer industry. Because of this varied experience we are able to pass on to you information that will help you adapt or replace your present equipment at minimum cost.

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International Minerals processes millions of tons of materials a year. Result is valuable experience — that you can draw on — in reducing handling costs through correct use of conveyors, fork trucks, car loading equipment, etc.

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Refer any formulation problem requiring computer applications to International's Industrial Engineering Staff. Our engineers also offer statistical quality control assistance when a process requires correction.

RESEARCH

International's Research Division maintains facilities at Skokie, Ill., and Mulberry, Fla., to test the action of plant nutrients. *This information is yours.* International also sponsors many university and state experiment stations, the results of which are circulated by our technical staff. You can profit from IMC research into plant food requirements for local areas and from other phases of our complete research into fertilizer production, uses and results.

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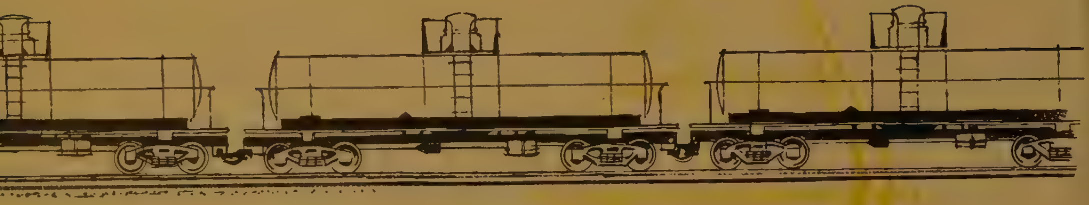

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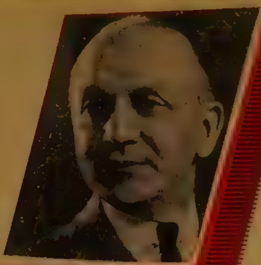
Fertilizer Views and News



By Vincent Sauchelli

Dr. Sauchelli is Chemical Technologist for National Plant Food Institute.

The Magruder Check Fertilizer Sample Work To Be Modernized

CHEMICAL control chemists of both industry and state laboratories are being requested to participate in a revised organization of what has been known since 1922 as the Magruder Check Fertilizer Sample Work. In that year, E. W. Magruder, chief chemist for the Royster Company, initiated the plan to send a sample of fertilizer to a number of fellow chemists to check the effectiveness of their methods and techniques. It is a great help to a working chemist to be able to do this. He might be getting wrong results from time to time without knowing it, and continue doing so for some time before finding it out. The check sample plan enables him to compare his results with those of other chemists analyzing the same sample. If they vary significantly from the general average, he can promptly investigate and make the necessary corrections.

The work started with about 30 participating chemists. Gradually the number increased until by 1958 the number reached 129, about equally divided among fertilizer, commercial and state control laboratories. Since 1922, the burden of preparing and distributing the sample and the compiled chemical analyses was carried exclusively by Royster. For this they have earned the gratitude and appreciation of all participants.

In recent years, statistical techniques have been introduced into many industries and research laboratories. It was to be expected that this influence would make itself felt in the check sample work. An increasingly urgent need was voiced to modernize the Magruder check sample plan by including statistical and other studies and broadening its scope. Suggestions regarding ways and means of reorganizing this work were first broached at the 1957 NPFI Conference on Chemical Control Problems. An advisory committee was organized to study the suggestions and consult with Royster Guano. This group held several meetings and worked up a plan which has finally been shaped into a definite basis for the new series. The plan is acceptable to the original sponsors and is being distributed among all the old list of participants and many additional laboratories for their acceptance. Beginning last month (January) the Magruder Check Fertilizer Sample begins a new series under a new sponsorship. A Joint Committee of the Association of American Fertilizer Control Officials and the National Plant Food Institute has taken responsibility for the program as follows: For AAFCO—Henry Davis (New Hampshire), C. W. Gehrke (Missouri), F. W. Quackenbush (Indiana), Stacy B. Randle (New Jersey); for the fertilizer industry—J. R. Archer (International Minerals & Chemical Corporation), C. H. Perrin (Canada Packers, Toronto, Canada), S. F. Thornton (Royster Guano), V. Sauchelli (NPFI), Chairman.

The new series will be continued to accord with its original purpose, to provide participating laboratories an opportunity to check on performance in relation to other laboratories. In addition, the new program provides these features: (1) Statistical design to permit analysis of the data and reports which are more meaningful than a simple listing of averages; (2) Samples derived from purified salts which are of known composition; and (3) Fertilizer samples of uniform particle size as well as "run-of-the-mill" samples.

The secretary-treasurer of AAFCO will issue application forms for participation and act as treasurer. A nominal fee of $18 a year is to cover cost of preparing and distributing 12 samples a year. The statistical work will be done free of cost the first year by the Statistical Department of W. R. Grace & Co., Washington Research Division, and the monthly summary of the report will be prepared and distributed by NPFI.

This new check sample program should appeal to all laboratory supervisors as well as the working chemists. The opportunity to evaluate the accuracy and precision of a laboratory's operations afforded by this new series should not be allowed to slip by. In the course of a year, very valuable information can be accumulated by each participant, and the net result generally should be an improvement in the quality of chemical analysis in our industry. This work meshes in very well with the major research project on sampling and chemical analytical methods currently underway, which is sponsored by NPFI with the cooperation of the AOAC and AAFCO.

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NEWS about the TRADE

New Pacific Coast Unit

The Pacific Coast Borax Co., division of the United States Borax & Chemical Corp., Los Angeles, has installed equipment at its Fort Worth, Texas, plant for the manufacture of liquid weed control materials.

Operation of the new equipment, which will serve railroads of the Fort Worth-Dallas area, will begin this spring. The company also announced the establishment of similar facilities at its Butte, Montana, plant to serve railroads of the northwest.

•

Gleissner Joins Frontier

Dr. Bruce D. Gleissner has joined the Frontier Chemical Company Division, Vulcan Materials Co., Wichita, Kans., as vice president and technical director.

Dr. Gleissner now is responsible for the production facilities of Frontier's Wichita and Denver City, Texas, plants and all technical operations, engineering, and the company's research and development program.

In 1944, Dr. Gleissner joined the American Cyanamid Company as a research biologist and subsequently was named manager of the insecticide department of Cyanamid's Agricultural Chemicals Division. Dr. Gleissner became assistant general manager of the Chlorinated Products Division of the Diamond Alkali Company in 1954 and was vice president of Diamond Black Leaf Co., a subsidiary.

•

Heyden Buys Strobane Rights

"Strobane," a terpene-based insecticide, has been purchased by the Heyden Newport Chemical Corp., New York, from the B. F. Goodrich Chemical Co., New York.

Heyden Newport will have all rights to manufacture and sell Strobane. The insecticide is said to possess a broad range of activity in the control of agricultural and livestock pests. Strobane currently is on the market in liquid and aerosol formulations for home use.

•

Stop Methyl Parathion Sales

The American Cyanamid Co., New York, has discontinued the sale of methyl parathion technical.

The company plans to place greater emphasis henceforth on the sale of malathion and ethyl parathion technical, which is sold under the trade name of Thiophos.

•

Bryant Is Dow Manager

Clyde A. Bryant has been named manager of the agricultural products merchandising section of the Dow Chemical Co., Midland, Mich. At the same time, Robert O. Fletcher was named an area coordinator for farm product sales and John H. Prine was named staff assistant to the sales manager.

Mr. Bryant joined Dow in 1948 and has been coordinator of farm product sales for the eastern third of the country.

Mr. Fletcher has been attached to the company's Seattle sales office and Mr. Prine has been handling market forecasting in Dow's sales planning section.

Coastal Fertilizer To C. A.

The first shipload of Mississippi-produced chemical fertilizer was shipped last month to Honduras. The fertilizer was produced by the Coastal Chemical Corp., and was the first of a number of shipments to be made to six Central American nations. Coastal Chemical is a Mississippi corporation with more than 5,000 farmer-stockholders in Mississippi, Alabama, Louisiana, Costa Rica, and Honduras.

•

NPFI Salesmen's School

A school for salesmen was held February 4th at the Deshler-Hilton Hotel, Columbus, Ohio, sponsored by National Plant Food Institute. Some 120 salesmen in the Ohio area were invited, but attendance swelled to about 150.

Russell Coleman outlined the purpose of the school,—which he explained was something of an experiment. The curriculum will be revised for other schools, based on the comments of the salesmen attending the February 4th meeting.

Discussions in Ohio dealt with the fertilizer customer, and answered such questions as—what is he like?—why does he need our product?—what are tools of selling fertilizer (soil testing, OSU recommendations, demonstrations, etc.).

•

Fertilizer Salesmen's Handbook

National Plant Food Institute have just completed publication of the "Fertilizer Salesmen's Handbook." Pocketsized, illustrated with cartoons, and in two-colors, the book of 220 pages is designed

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for easy reading and understanding. Members may obtain copies from the Institute.

The text carries a variety of data and information to help salesmen talk intelligently to farmers. It deals with such topics as "where and how to do it," "choosing the right kind of fertilizer, and how to go about it," "organic farming with fertilizer," "off season efforts for on-season selling."

The six chapters are: 1) Know your customer. 2) Know your product. 3) Economics 4) Facts and Figures 5) Terms 6) Sources of information, other aids for selling.

National Plant Food Institute, in preparing the book, used much of the information it obtained in its survey a year ago on farmers and how they are influenced.

The book was introduced at the Fertilizer Salesmen's School held February 4th in Columbus, Ohio, and sponsored by NPFI. The school was the first in what may be a fairly substantial program, designed to bridge the gap between dealer schools and the fertilizer salesman.

•

Alabama Control Conference

The 12th Alabama Pest Control Conference will be held Feb. 24 and 25 in Duncan Hall on the Alabama Polytechnic Institute campus, Auburn, Ala. The conference is sponsored by the Alabama Association for the control of economic pests in cooperation with the college.

A panel to discuss "What's New" will be led by Dr. B. W. Arthur of the Auburn Department of Zoology-Entomology. Among the topics to be covered are new pests; diseases of vegetables and cereals; insects of vegetable, forests, livestock legumes, corn, and peanuts; systemic insecticides; weed control; nematodes; and aquatic weeds.

Another panel will discuss the effects of irrigation on pest control in cotton. In all, more than 35 authorities from the college, the U.S.D.A., and the industry will be heard from.

Pesticide Stocks Lower

The U. S. Department of Agriculture last month reported that carryover stocks of pesticides on Sept. 30, 1958, averaged about 10 per cent lower than on the same date in 1957.

Larger carryovers of newer materials than in 1957, expecially organic phosphates and weed killers, were more than offset by shorter inventories of DDT and grain and soil fumigants, the report said.

•

Louisiana Recommends Sevin

The Louisiana Extension Service has added Sevin to the list of materials recommended for cotton insect control in 1959.

Sevin is being recommended for control of boll weevil, bollworm, and pink bollworm at the rate of 1 to 2 pounds of technical material per acre. For thrips, the cotton fleahopper, and the cotton leafworm, Sevin is being recommended at the rate of one-half pound per acre, applied at five-day intervals. At present, it is being recommended in dust form only. Sevin is a product of the Union Carbide Chemicals Co., Division of Union Carbide Corp., New York.

•

John E. Dudley Dies

John E. Dudley, seventy-two, an entomologist for the U. S. Department of Agriculture from 1911 to his retirement in 1951, died Jan. 24 in St. Petersburg, Fla.

11th Calif. Weed Conf.

The 11th annual California Weed Conference was held in the Miramar Hotel Auditorium, Jan. 20, at Santa Barbara, Calif. Sessions were devoted to a wide variety of weed problems.

C. Bruce Wade of Redding, Calif., was named new president of the Conference. Other officers are Dr. B. E. Day, U of C, vice-president, W. B. McHenry, U of C, secretary, and Stanley W. Strew, Colloidal Products, treasurer.

•

Frontier Transfers Garnier

Gene Garnier has been transferred to the Denver-Rocky Mountain sales area by the Frontier Chemical Co. Division, Vulcan Materials Co., Chicago, Ill., territory.

•

Calif. Fert. Conf. June 29

The 7th annual California Fertilizer Conference will be held on the campus of the University of California at Davis, June 29-30.

•

Add Granulation Facilities

Construction of a $500,000 addition to its present fertilizer plant at Ft. Pierce, Fla., has been started by W. R. Grace & Co. Davison Chemical Division.

The new equipment will be used to manufacture granulated fertilizers and will make the plant the first source of such products in the Ft. Pierce area.

Midget Ammonia Plant Produces 30 Tons Per Day

Said to be the smallest completely integrated ammonia plant in the United States, this plant produces 30 tons per day of ammonia for the Apache Powder Co's explosives and chemicals works at Curtiss, Arizona.

The plant was built by the Girdler Construction Division of the Chemetron Corp. and employs conventional hydrocarbon refining operations using Girdler catalysts in producing ammonia synthesis gas from natural gas. Despite its size, the plant is said to operate at direct production costs competitive with more conventional installations of 100-ton capacity or more.

DAVISON Hi-Flo Gran-U-Lated Triple Superphosphate is unexcelled by any other

✱ $(S_1Q_2D_2TA_1)$ The Davison formula of properly proportioned parts of Service, Quality, Dependability, Delivery and Technical Assistance $(S_1Q_2D_2TA_1)$ is as important to you in your choice of source as anything else we could name.

In every field, there is always one particular brand that is so outstanding that it is head and shoulders above the competition. That is true of Davison Hi-Flo Gran-U-Lated Triple Superphosphate. Here is the product that *is* the standard of comparison for all other granulated triples. Davison Gran-U-Lated Triple Superphosphate is uniform in particle size . . . dust free and will not break down or crumble in the bag. It is ideal for direct application or for formulation of dry materials. Most of all, with Davison Gran-U-Lated you are certain of constant uniformity . . . it is GUARANTEED 46% available P_2O_5 . . . every time.

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Named To Head Sales

Clemons Beales Engle

The American Agricultural Chemical Co., New York, has announced the creation of three sales divisions.

C. R. Clemons (left), former manager at Agrico's Buffalo, N. Y., branch is manager of the Mid-Southern Sales Division with headquarters at Greensboro, N. C. The division covers plants at Alexandria and Norfolk, Va.; Greensboro and Henderson, N. C.; Spartanburg, Charleston, and Columbia, S. C.; and Savannah, Ga.

W. L. Beales is manager of the Northeast Sales Division with headquarters in New York. His territory includes Agrico's offices at Baltimore, Md.; Buffalo and Three Rivers, N. Y.; Carteret, N. J.; North Weymouth, Mass.; and in Canada. Mr. Beales had been manager of Agrico's Saginaw, Mich., branch.

J. W. Engle (right), former manager of Agrico's East St. Louis branch, heads the Western Sales Division from offices in St. Louis, Mo. Included in the Western Division are offices at Danville, East St. Louis, and Fulton, Ill.; Seymour, Ind.; Humboldt, Iowa; and Olathe, Kans.

•

Penick Plant Superintendent

John H. MacDonald recently was appointed plant superintendent for the Lyndhurst, N. J., plant of S. B. Penick & Co., New York. He has been a member of the plant technical staff since he joined the company a year ago.

•

Campbell Joins W. R. Grace

Stuart A. Campbell has joined W. R. Grace & Co., Grace Chemical Division, Memphis, Tenn., as a sales representative. He will work out of the company's Chicago office and cover Illinois, Iowa, Indiana, Ohio, Michigan, Wisconsin, Minnesota, Nebraska North Dakota, and South Dakota.

Mr. Campbell previously was with Spencer Kellogg & Sons., Chi.

•

PCA Appoints Two

R. R. Knill, who has been mine superintendent since 1945, has been appointed general superintendent for the Potash Company of America, Carlsbad, N. Mex. In addition to his duties at the Carlsbad plant, Mr. Knill also supervises PCA's potassium sulphate operations at Dumas, Texas.

Replacing Mr. Knill as mine superintendent is David Rice, who has been assistant mine superintendent for the past two years.

•

Stevens Elected Lebanon V-P

Clyde D. Stevens has been named vice president of the Lebanon Chemicals Corp., Lebanon, Pa. He had been plant manager.

Kentucky Fertilizer Firm Sold

The Burley Belt Plant Food Works, Inc., a fertilizer manufacturing company of Lexington, Ky., has been sold to Albert G. Clay, Herbert Moore, and Gilbert Nooe. The price was not announced.

Under the new ownership, Mr. Moore is president and Mr. Clay is vice president. Robert Terhune and Allan Peck, the former owners, are continuing with the firm in advisory and sales capacities.

TEXAS GROUP CALLS FOR MORE FERTILIZER USE

SPEAKERS at the annual Texas Fertilizer Conference held at Texas A&M College, January 6-7, emphasized that the State's agricultural producers could profitably up their use of fertilizers several times above present usage.

Dr. A. G. Caldwell of A&M's Department of Agronomy said that more than twice the amount of fertilizer presently used in the entire state could be utilized in the eastern part of Texas on pastures. A panel of agronomists and horticulturists said that if corn, grain sorghums, cotton, wheat, rice and horticultural crops received the recommended applications of plant foods, more than five times as much fertilizer would be required as is presently being used in the state.

Extension pasture specialist, E. M. Trew, emphasized that correct conditioning of the soil, adequate moisture and selecting the correct species were vitally important to the successful establishment of pastures in east Texas. Agronomist F. L. Fisher of the Texas Agricultural Experiment Station used colored slides to show the 150 in attendance at the conference that year-round pastures in east Texas were not only possible but highly profitable. He said the liberal use of fertilizers on small grains for forage, on common and Coastal Bermuda grass pastures and on irrigated Coastal pastures gave very large increases in yield.

E. K. Chandler of the National Plant Food Institute told the group that producers in northwest Louisiana—an area similar to east Texas—had never had a failure with Coastal Bermuda grass in this sandy area, and had been able to produce 8 tons of hay an acre by using 400 pounds of nitrogen and adequate amounts of phosphate and potash.

A Beaumont banker, Chas. Schumacker, told the group that fertilizer use was considered the mark of an efficient farmer. The Texas Highway Department, said D. L. Campbell of the Red Star Fertilizer Company, is becoming increasingly interested in turf fertilization for establishing sod along new highways and for protecting grades along existing roads.

Dr. R. L. Beacher of the N.P.F.I.'s southwestern office presented their scholarship to Aggie Boyd Proctor of DeKalb, Texas. The $200 cash award, a key and the addition of his name to a plaque is presented annually to an outstanding junior in the Agronomy Department of A&M.

In a final session, George Kelt was elected president of the Texas Plant Food Educational Society; M. D. Seay vice president and Sherman Clark was re-elected secretary.

Extension Soil Chemist W. F. Bennett explained how soil testing could benefit both the producer and dealer. Dr. W. O. Trogdon, head, Agronomy Department, urged the fertilizer industry to encourage their dealers to sell on the basis of need rather than on the basis of what is in their warehouse.

Dow Producing Polyethylene

The Dow Chemical Co., Midland, Mich., has begun production of polyethylene film for agricultural uses such as mulching, trench silo liners or covers, weather proofing, ditch and pond liners, temporary greenhouses, and as tarpaulins.

Trademarked Polyfilm, the product will be produced by Extruders, Inc., a Dow subsidiary located in Hawthorne, Calif.

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Rutgers Horticulture Classes

Rutgers University, New Brunswick, N. J., will offer its first evening course in basic horticulture starting February 4. Classes will be held Wednesdays from 6:30 to 9 p.m. at the College of Agriculture.

The course is expected to appeal to home gardeners, nursery employees, and others within reach of New Brunswick. Richard H. Merritt, instructor on the Department of Horticulture staff, will be the teacher.

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Bradley & Baker Names Two

W. M. Bryan and S. Winfield Hill have joined Bradley & Baker, New York, as sales representatives. Both have been assigned to the firm's staff at Norfolk, Va.

Mr. Bryan will cover the southern half of Virginia and Mr. Hill will call on customers in Virginia and parts of North Carolina.

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Pennsylvania Lime Conf.

The 1959 Pennsylvania Fertilizer and Lime Conference will be held Feb. 11 to 13 at the Nittany Lion Inn, University Park, Pa. The conference is planned jointly by the Pennsylvania Plant Food Educational Society and the Pennsylvania State University.

The conference will start with presentations on salesmanship and advertising and a panel discussion of the economics of fertilizer usage. Various phases of fertilizer usage will be covered, including field demonstrations of liquid fertilizers, corn production, and nitrogen fertilizers. Professor Reeshon Feuer of Cornell University will address the conference on the relation of soil associations to fertilizer usage.

Specialty fertilizers and their uses, including lawn and fruit fertilization, gibberellins, and trace elements, also will be discussed at the meeting. Dr. Howard B. Sprague, head of the Department of Agronomy, Penn. State University, is president of the association.

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Agrico Fertilizer Agronomist

C. W. Barbee, assistant agronomist at the American Agricultural Chemical Co.'s laboratory in Detroit, Mich., has been named agronomist for Agrico's new Knoxville Fertilizer Division.

The Knoxville division is comprised of the plants and sales areas of the former Knoxville Fertilizer Co., which was purchased by A.A.C. company last fall. The division has plants at Knoxville, Nashville, and Johnson City, Tenn., and at London, Ky. The division's headquarters are at Knoxville, where Mr. Barbee is located.

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Courtney Joins CSC

Hugh H. Courtney Jr. has joined the Agricultural Chemicals Department of Commercial Solvents Corp., New York. His headquarters are at CSC's district office in Atlanta, Ga.

Mr. Courtney will cover north Georgia and central and eastern Tennessee.

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Moxley Succeeds Holland

Harry E. Moxley, assistant superintendent of the International Minerals & Chemical Corp.'s fertilizer plant in Tupelo, Miss., has been named superintendent of the plant to succeed T. L. Holland, who has retired after 33 years.

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St. Regis Names Callahan

The St. Regis Paper Co., New York, has appointed Robert F. Callahan as manager of its Multiwall Packaging Division sales office at Kansas City, Mo. Mr. Callahan had been a sales representative at the firm's San Francisco office.

Frank H. Rendler, who had been manager of the Kansas City office, has been transferred to the Chicago sales office.

To Make Stretchable Paper

The Raymond Bag Corp., Middletown, Ohio, has been licensed by Clupak, Inc., New York, to produce multiwall bags made from Clupak's new stretchable paper.

The Albemarle Paper Manufacturing Co., Richmond, Va., Raymond's parent company, said that the Clupak process will be placed in operation on machines at its Halifax Division in Roanoke Rapids, North Carolina. Bags will be manufactured at Raymond plants in Middletown, Ohio, and Richmond, Va.

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Caudle Is Senior VP

The Eastern States Petroleum & Chemical Corp., Houston, Texas, has named J. R. Caudle as senior vice president of all sales. The office is a new position with the company.

In addition to managing the petroleum and chemical sales departments, Mr. Caudle will have under his direction the traffic and the marketing departments. He joined the company in 1954 and was named vice president of chemical sales in 1958.

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Arizona Fertilizer Conf.

The importance of the planned and scientific use of fertilizer to increase farm profits was the theme of the second annual Arizona Fertilizer Conference held Jan. 21 on the University of Arizona campus.

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Duval Extends Contract

The Duval Sulphur & Potash Co., Carlsbad, N. Mex., and the Ashcraft-Wilkinson Co., Atlanta, Ga., have extended the contract under which Ashcraft-Wilkinson represents Duval as its exclusive sales agent for potash and domestic sulphur.

The agreement began when Duval entered the sulphur industry thirty years ago and has continued since that time. In 1950, the agreement was expanded to include Duval's production of muriate of potash.

Arcadian News

Volume 4 For Manufacturers of Mixed Fertilizers Number 2

FERTILIZER SALES OUTLOOK IS PROMISING FOR 1959!

Survey Reveals Widespread Optimism

Many signs point to a promising year for fertilizer sales in 1959. To determine the market potential for the coming year, Nitrogen Division recently surveyed opinions of fertilizer men across the country. If weather conditions are normal or better, fertilizer men everywhere agree most factors indicate a good fertilizer year ahead.

Acreages of major crops are expected to increase, it was pointed out in a large number of interviews. Corn acreage probably will rise from 74.4 million acres in 1958 to 77 or 78 million acres in 1959. Cotton acreage will be upped from 11.9 million to approximately 17 million acres. Planted acreage of winter wheat exceeds last year by a million.

Although the Conservation Reserve probably will increase by about 12 million acres, the end of the Soil Bank's acreage reserve will release more than 17 million acres. This will mean a net of about 5 million acres more in production in 1959 over 1958.

Farm Income Good

Farm Income as a whole has been good this past year, which means farm finances now are in better shape.

Production costs on the farm have continued to increase, but fertilizer costs have not. Fertilizer prices have remained constant to slightly lower, and industry leaders agree this should lead to increased fertilizer use as a method of reducing farm unit costs of production.

Another fact repeatedly mentioned by fertilizer representatives is that last year's heavy yields of crops placed a heavy drain on basic plant food nutrients. Prudent farmers know such yields have robbed the soil of important elements. Also, this will be emphasized to growers by many county agents and other agricultural advisors.

U.S.D.A. agricultural scientists at Beltsville, Maryland, recently listed important plant foods lost in 1958, and gave the following priority to their replacement in the soil: Nitrogen is first, potash second and phosphorus third.

Southern Comments

A sample opinion in Georgia about the coming fertilizer season is that tonnage will reach an all-time high in that state. "Movement of this fertilizer will be earlier than 1958 and a little more evenly distributed, barring bad weather conditions," a fertilizer industry spokesman emphasizes. "At least 95% of all manufacturers believe there will be a record tonnage sold in the spring of 1959," he says.

From South Carolina comes a similar statement. An industry leader explains: "Spring sales of mixed fertilizer are expected to increase by 10 to 12% over last year. They will probably go up to 450,000 tons.

"Largest increase is expected in areas where cotton is the main crop. In heavy cotton-producing areas, manufacturers believe sales will rise 20 to 30%," he concludes.

A Kentucky-Tennessee fertilizer man estimates cotton-producing counties will experience a 15 to 20% fertilizer sales increase. "However, sales in non-cotton producing counties will be up only 4% over last spring," he predicts. "There is no pessimism about fertilizer sales being expressed by any manufacturers."

A Mississippian comments: "Cotton and rice will show increased mixed goods usage; perhaps up as much as 10%."

Southeast Is Optimistic

Farther down the Eastern Seaboard some optimistic statements are heard. One Virginia manufacturer believes fertilizer consumption may increase 10% this year due to absence of the Soil Bank.

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A North Carolina manufacturer says he estimates 20% less potatoes will be planted this year, and the acreage will be shifted to corn and other crops. "This will show an increase in the use of Nitrogen for side or top-dressing application," he declares.

Another North Carolina manufacturer estimates a 10 to 15% increase in the use of fertilizer in the Piedmont Area. A number of comments point out that fertilizer will move two to three weeks earlier than last spring, weather permitting.

Eastern Situation Different

With a different crop situation in the East, fertilizer prospects appear to be good, though not as outstanding as in the South. According to one fertilizer man, "Sales of mixed goods probably will increase this spring. The outlook in New Jersey may not be quite as bright as in Pennsylvania. Although New Jersey had a poor season last year, we still expect farmers to shoot for high yields in order to recover. Pennsylvania should find not only greater use for fertilizer, but also for higher-analysis goods, such as 10-10-10 and 8-16-16.

"New Jersey will plow down and side dress according to crop needs," he explains, "and Pennsylvania will continue to plow down and use starter fertilizer rather than side dress.

"With a large dairy industry that has fertilized at low levels in the past, but that now is awakening to the value of high fertilization, we hope for a very good spring."

A comment which summarized the general picture for the Northeast was as follows: "There is a definite trend toward use of higher-analysis fertilizers, both granular and semi-granular. This mainly is due to recommendations from college experiment stations for use of larger amounts of higher-analysis fertilizers per acre.

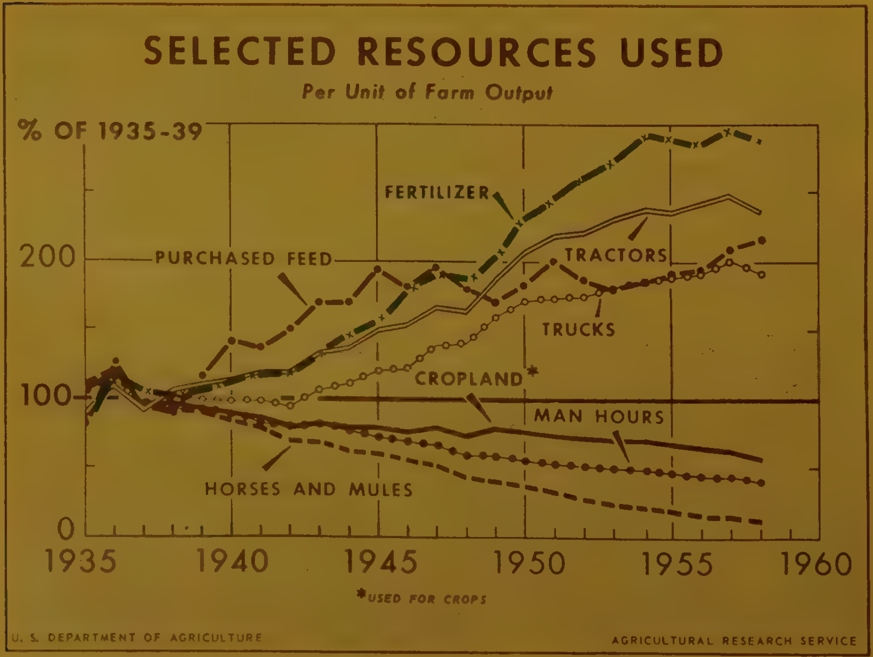
"The spring of 1958 was late, and with average weather conditions, it is expected that spring movement of fertilizer this year will be at least two weeks sooner. Thus fertilizer manufacturers will in all probability experience an earlier movement, but not as extremely peaked as last year."

Other Markets Analyzed

"Northeastern cash crops such as potatoes, apples, grain corn, small grains and vegetables experienced a poor year either in yield or in market price of the product," one fertilizer man points out. "This would tend to limit the volume of mixed fertilizer, but on the other hand the general dairy farmer will use more fertilizer this year than last.

"Another factor important to the Northeast," he goes on, "is the specialty market for home and garden use. This market should increase appreciably in 1959."

A New York state fertilizer man agrees with the trend toward higher-analysis granular fertilizer and believes it will increase greatly this spring. He estimates there will be a slight increase in tons of plant food sold. This is based on the opinion that cash crop vegetable and grain farmers will hold steadily or decrease only slightly their acre plantings and fertilizer use this spring, while dairy farmers will increase their fertilizer use.



U. S. DEPARTMENT OF AGRICULTURE — AGRICULTURAL RESEARCH SERVICE

In Maine a fertilizer leader notes: "There is generally a feeling of optimism about tonnage in New England, with the possible exception of Aroostook County, Maine, where potato prices have been distressing. But bright spots elsewhere offset the Aroostook situation.

"Manufacturers are becoming more aware of the dairy potential. Examples of this are found in the new higher-analysis 1-1-1 ratios and the new 3-2-2 ratios and plans built around nitrogen with mixed grades to fit.

"Tobacco in the Connecticut Valley will definitely be increased. The sale of fertilizer in bulk is probably a way that some manufacturers can increase sales. I believe sales will be as good as last year and perhaps a little better. The dairyman is our chance to grow."

Midwestern Opinions

"More tons of high-analysis fertilizer and a greater tonnage of all ratios will be sold in Indiana and Southern Ohio this spring as compared with last." This is the comment of one fertilizer representative contacted during the Nitrogen Division survey.

"Many plants have already noted an increase for the coming year," he explains, "although the bulk of the movement will come at planting time and peaking of shipments is expected to exceed last year. Almost every plant anticipates an increased tonnage over 1958 due to an acreage increase in corn."

Here is another similar comment from a fertilizer spokesman: "Anticipated sales of fertilizer in the North Central part of the Midwest are good for the spring season. Crop yields and fertilizer responses were good to excellent last year. Capital for fertilizer expenditure is available."

Best Outlook Since 1954

As one Minnesota manufacturer said, "The only thing that can prevent this spring from being a boom season is the weather—either too wet or too dry."

An Iowa manufacturer added, "We are looking our best season in the eye!"

These comments reflect the optimism prevailing throughout the area. There is a definite indication from dealers that farmers will start taking delivery of fertilizer earlier than in previous seasons.

"In Illinois," a fertilizer man emphasizes, "there is more hope for the coming season than any year since the drouths of 1953 and 1954. Prior to last year, mixed fertilizer tonnage had been reduced annually for four years. It sagged to its lowest spring tonnage since 1951. Last spring there was a small increase in tonnage of 40,000 tons. It is hoped the tonnage this spring will equal or even surpass the 447,000 tons sold in the spring of 1954 in Illinois," he concludes.

Prospects also are bright in Iowa. The 1958 crops sets a record in this state. Farmers are ready to buy more fertilizer than ever before, surveys indicate.

Similar views are expressed in Kansas and Nebraska where another fertilizer man again underscores the fact that manufacturers are more optimistic than any year since 1954. "The fall movement of fertilizer was the best since that season," he states. "There was considerable buying in November and December of 1958, and much of this tonnage was insecticide-fertilizer mixtures. The November vote on corn allotments makes manufacturers feel pretty certain that a lot more acres of corn will be fertilized in the spring ahead. Also, moisture of surface and subsoils is generally very adequate at this point."

Views From The West

"Throughout the Rocky Mountain area," says a fertilizer man, "more high-analysis fertilizers and straight materials will be sold. More companies will produce these products.

"The large dealers already have begun ordering carload lots. Prices are down generally, but everybody is hopeful for greater movement of everything they can sell this year."

Good Spring Season Ahead

While the outlook for fertilizer sales is brightest in the Midwest and South, as was expected, opportunities in the East and West are also promising.

In a few scattered areas where only small enthusiasm is voiced, this seems to stem from the fact that there were abundant crops which glutted the market last year and brought farmers low margins of profits, resulting in a lack of capital for fertilizer investment.

However, it is significant to note that there are no serious reports of pessimism by fertilizer men in any section of the country. Throughout the country as a whole, there is a landslide of optimistic reports. A good spring season appears to be ahead for the fertilizer industry!

Millions of children, like this little girl and her baby brother, will need increased farm production during the years ahead.

Boom in Babies Builds Huge Future Markets!

By the year 2,000, if our population grows at its present rate, we will be a nation of 388 million people, or 213 million more than today. Even by 1980, our population will be 100 million greater than today. In 1980, we will need 44½ billion quarts of milk—16 billion more than we produced in 1958. We will eat 23 billion pounds of beef, 17½ billion pounds of pork, and 33 billion pounds of flour. Our use of textile fibers will be up to 10½ billion pounds per year.

Right now, we in America have plenty of food. In 1958, we produced more than ever before, on the smallest crop acreage in 40 years. We have mounting surpluses of certain crops like wheat. But our total food production is only a few percentage points greater than our needs. By the early 1960's, many experts feel production and needs may equalize.

Less Farm Land

In the meantime, we are losing 1¼ million acres of farmland per year to homes, highways and factories. Cities, roads, railroads and factories occupy more than 115 million acres of land now—when our population is 175 million people. Add 213 million more people, and it's easy to see that much good farmland will go out of production by 1980.

True, we continue to drain swamps and plow up grassland. Several million acres of brushland are being reclaimed to grow grass to produce beef. We irrigate more land, but water supplies are limited. As population increases, less water is left for crop use. Desalting seawater and pumping it uphill to farmland is still prohibitive in cost. At $200 per acre foot, f.o.b. sea level, desalted seawater is no bargain! And cloud seeding as yet cannot be depended upon for crop expansion.

A person can eat only so much food per year. But in recent years, we have been upgrading our diets. We eat more meat, milk, eggs, vegetables, fruit and less grain and potatoes. It takes more agricultural effort to produce these prized foods. And population growth will expand our food needs in two ways.

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One is by greatly increased numbers of mouths to feed. The other is in the increased proportion of teenagers and young people in our population. Teenagers eat far more than young children or older people.

Bigger Farms

Each year we are farming our land better. But there is less new land to farm. Labor, taxes, land prices, and poor quality of marginal farm lands all limit the practical expansion of crop acreage. Farms get bigger, however, because the size of business must increase to earn a family livelihood.

Modern farm methods continue to boost crop and livestock yields from every acre. Power machinery, improved seed, weed killers, other chemicals—all boost yields per acre. Fertilizer—far above anything else—is helping to make farming more efficient. And the cost of fertilizer has remained low as compared to other things the farmer buys.

Need for Fertilizer

If our crop yields were to stay where they are, we would need 300 million more acres of cropland by 1980. We will not have the land. But we will have enough fertilizer to produce 57% more food on about our present crop acreage.

Actually, we are far from farming "as good as we know how"—with fertilizer. In 1958, a banner year for corn yields, we averaged 51 bushels per acre. Yet thousands of farmers get 100 bushels per acre, hundreds get 200 bushels per acre. How do they do it? By planting thick enough, and using enough fertilizer. Only 60% of our cornland gets any fertilizer at all. And the corn that is fertilized averages less than 300 pounds per acre. The big yields come with 500 to 1,000 pounds of fertilizer per acre.

Other large-acreage crops get less fertilizer than corn. Only 30% of our wheat and 26% of our improved pastures are fertilized. Even with high-value crops like fruit and vegetables, only 68% of the area planted gets commercial fertilizer. There is all kinds of room for expanding fertilizer tonnage.

Land Alone Not Enough

Every year farmers (and other people) keep bidding up the price of farm land. Yet every year the importance of land to food production becomes smaller. What farmers put into the land is what makes big crops and big profits. We can't afford to put a lot of labor into a crop-acre. And we don't have to. We can use more fertilizer! Fertilizer builds big yields at low cost per bushel or pound. When 30¢ to 40¢ worth of fertilizer makes an extra bushel of corn, worth $1 or more, it pays well to use a lot of fertilizer on every acre. When it costs $40 for land, labor, taxes, seed and machinery to grow a 50-bushel corn crop, and it costs $58 to grow a 100-bushel crop with fertilizer, it is easy to see that the profits lie in higher yields. We will need more food, and fertilizer can produce it at low cost for the consumer and big profits for the farmer. The selling of fertilizer is going to be a good business in the years ahead—and a service to the human race!

Prepare Now for the Spring Rush

With the big spring fertilizer season just around the corner, it's wise to get ready now to handle a large volume of orders. Then you will be set to make the most out of all your sales opportunities. Here are some helpful tips:

1. Build all the inventory you can hold to meet the spring rush. Make sure you have sufficient mixing and bagging facilities. Additional warehouse facilities in your heaviest areas will be good insurance this spring, in case of bad weather.

2. Campaign to urge dealers and farmers to take fertilizer early. Advise customers to order proper analyses in advance of the season. Fertilizer can be stored in the barn or in the ground.

3. Urge dealers to equip their operations with bulk-handling equipment and suggest they be sure to have a fast means for loading customers' orders during the rush season.

4. Make a dealer survey to determine grades and amounts that will be needed, and get an idea of what bag and bulk shipments will be required.

5. Order raw materials before you need them. This will assure you of having the right supplies, especially those materials that might become short during the spring.

6. Secure as much storage as possible for your bagged fertilizer. When the big push comes, some manufacturers bag and ship during the day, and run the plant at night. This can result in producing and shipping fertilizer that is not well-cured. Additional bag storage will help avoid this.

7. Check all your plant equipment and office supplies. Make necessary repairs well in advance of the season. A well-stocked plant with smooth-running machinery avoids costly breakdowns and tonnage-cutting slowdowns after the heavy shipping season starts.

BEST N FOR YOUR N-P-K

Arcadian

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There are many reasons why it pays to use ARCADIAN® Nitrogen in the manufacture of your mixed fertilizers. Here are only a few:

You are served by the leading producer of the most complete line of nitrogen products on the market. You have many different nitrogen solutions from which to select those best suited to your ammoniation methods and equipment. You get formulation assistance and manufacturing advice from the best-qualified technical service staff in the industry. You benefit from millions of tons of nitrogen experience and the enterprising research that originated nitrogen solutions. You get many important bonus values when you make ARCADIAN Nitrogen the N in your N-P-K.

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N-dure® Solution
A-N-L® Nitrogen Fertilizer
Ammonium Nitrate
UREA 45 Nitrogen Fertilizer
Sulphate of Ammonia
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Monsanto Reorganizes Organic and Inorganic Divisions

MONSANTO Chemical Co.'s Organic Chemicals Division is increasing the size of its agricultural chemicals sales staff by more than 100 per cent for more intensive coverage of its national distribution of these products, it was announced last month.

The expanded sales force, which became effective January 15, markets the division's technical grade agricultural chemicals to formulators, as well as the Monsanto-brand packaged herbicides and insecticides. The former group of products previously was sold by the division's regular field sales force.

According to James W. Starrett Jr., manager of agricultural chemicals sales for the Organic division, the number of technical sales specialists in the department will be increased to four men who will provide technical service and assistance to customers throughout the U. S. All members of the agricultural sales force, he added, are trained in the handling and sales of agricultural chemicals.

The division has established five new sales areas. They include the western area with headquarters at San Francisco; the south central area with headquarters at Luling, La.; the north central area with headquarters at Des Moines, Iowa; the southeast area with headquarters at Orlando, Fla., and the northeast area. Headquarters for the latter area will be in the vicinity of N. Y. C., Starrett said.

Charles P. Zorsch of St. Louis, manager of farm chemicals sales, has been named to newly created position of merchandising manager for agricultural chemicals. He will continue to assist in the direction of the merchandising activities of the field sales staff in the five areas.

Charles L. Fetzner, former district sales manager for the Organic division at San Francisco, was named western district manager. Claiborne L. Barber of St. Louis was appointed south central area supervisor.

Robert L. Olcott of Des Moines, Iowa, was appointed area supervisor of the north central area. Alwin C. Sherman of St. Louis was named southeast area supervisor.

The sales of agricultural chemicals in the northeast will continue to be the responsibility of Charles A. Leonard of Harrisburg, Pa., who will be based eventually closer to New York City.

Three sales specialists also were named to the enlarged agricultural chemicals sales department. They include R. R. Wangerin, J. M. Magner and Dr. Earl C. Spurrier. They will operate from the division's St. Louis office.

Inorganic Chemicals Division

Monsanto's Inorganic Chemicals Division reorganized its manufacturing and engineering departments effective Feb. 1.

R. R. Rumer, manager of the division's Monsanto, Idaho, plant, was named a director of manufacturing (nitrogen and heavy chemicals), and will be responsible for plants at Everett, Mass.; Camden, N. J.; El Dorado, Ark.; and Luling, La. He also will be responsible for Inorganic division manufacturing facilities at the company's plants at Monsanto, Ill.; Avon, Calif.; Anniston, Ala.; and Nitro, W. Va. F. P. Hendrickson of Soda Springs, Idaho, now maintenance superintendent of the Idaho plant, succeeds Mr. Rumer as plant manager.

Herbert O. Tittel, manager of the division's Trenton, Mich., plant, was named a director of manufacturing (phosphates and phosphorus) and will be responsible for plants at Carondelet, Mo.; Monsanto, Tenn.; Monsanto, Idaho; Kearny, N. J.; and Trenton, Mich. He also will be responsible for Inorganic division manufacturing facilities at Long Beach, Calif., and for package phosphorus burner plants. B. Ross Nason of St. Louis, formerly assistant director of the engineering department succeeds Tittel as plant manager at Trenton.

AAC Buys Kansas Firm

The American Agricultural Chemical Co., New York, has purchased Deep-Root Fertilizers, Inc., Olathe, Kansas.

The Deep-Root plant which will offer Agrico fertilizers to the eastern Kansas—western Missouri area, becomes the first Agrico plant west of the Missouri River.

Central Starts Shipments

The Central Farmers Fertilizer Co. has shipped its first carload of rock phosphate ore from its mine and plant at Georgetown Canyon, Idaho. The shipment went to the Joplin, Mo., plant of the Farmers Chemical Co., where it will be processed into ammonium phosphate.

To Sell For Geigy

Wilbur C. Hanes has been named sales representative for the Southern California and Arizona areas by Geigy Agricultural Chemicals, division of Geigy Chemical Corp., New York.

Mr. Hanes formerly headed a pest control program for the Monrovia Nursery Co. and, in 1950, joined the Trojan Laboratories as manager of pest control service and as an agricultural chemical consultant.

To Build In Iran

A contract has been signed between Montecatini, Italy's largest chemical company, and the Minister of Industry and Mines of the Iranian government for the construction of that country's first nitrogen fertilizer plant, near Shiraz. Montecatini has been appointed general advisor to the Iranian government for the project.

Names Pacific Agro Co.

The Nitroform Agricultural Chemical Co., Woonsocket, R. I., has appointed the Pacific Agro Co., Seattle, Wash., to handle sales in Oregon, Washington, and Alaska.

Magcobar CARRIERS

are DESERT DRY

Magcobar's exclusive "Slow Burn" drying process produces carriers and diluents of a uniformly low moisture content, just as the desert sun slowly and thoroughly dehydrates objects exposed to it over extended periods. This painstaking, slower, lower-temperature drying by Magcobar guarantees formulators a *complete line* of both pulverized and granular carriers that are more uniform and more sorptive, with better storage and handling qualities.

CARRICLAY	ARROWHEAD	PULGITE
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Granular and Pulverized	Bentonite	Granular and Pulverized

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AGRICULTURAL AND INDUSTRIAL PRODUCTS

ONE OF THE DRESSER INDUSTRIES

Agricultural Chemicals Market Review

Sodium Chlorate up ½¢

The American Potash & Chemical Corporation has announced a price increase of one-half cent per pound for sodium chlorate packaged in steel drums and sold in the 11 western states. The new price is 10½ cents per pound for carload lots, f.o.b. Henderson, Nev. There has been no change announced for the price of bulk or tank car lots.

Sodium Nitrate Up $1/Ton

An advance of $1 per ton was announced last month for domestic and Chilean sodium nitrate and ammonium nitrate limestone. The new price for domestic sodium nitrate goes to $45.50 per ton in multiwall bags, carlots f.o.b., and to $41.50 per ton in bulk works. Chilean nitrate is quoted at the same levels, f.o.b. Atlantic and Gulf ports. Ammonium nitrate limestone also was higher at $45.50 per ton.

Amm. Sulfate Export

Spain recently placed contracts for 388,000 tons of ammonium sulfate, of which 100,000 tons were purchased in the U. S. The balance was distributed among suppliers in Germany, Holland, Belgium, and Italy.

British N Export

The British Board of Trade has announced the removal of export controls on certain nitrogenous fertilizers which now may be exported to any destination without licenses, according to the U. S. Embassy in London.

DDT Bids Open

DDT trading reportedly was spotty last month, chiefly for immediate needs. Prices were without change and steady. Bids recently were submitted by suppliers for an additional lot of 21,000,000 pounds of 75 per cent wettable powder for the World Health Organization's antimalaria program. Contracts for this additional supply of DDT have not been awarded yet. Shipments against former contracts booked by WHO, however, reportedly were moving steadily.

Sulphur Use Down

According to one manufacturer, the Freeport Sulphur Co., New York, the consumption of sulphur toward the end of 1958 registered an increase over earlier months, but the gain was insufficient to bring the annual rate to the level achieved in 1957. The company attributed the lessened use of sulphur to the decline in business activity.

Preliminary data indicate that total domestic consumption of sulphur was off fractionally from 1957, reflecting the lower output of such major consuming industries as paper, steel, petroleum refining, rubber, and textiles. However, the relatively good year experienced by the fertilizer industry and segments of the chemicals industry, two of the largest consumers of sulphur, helped to bolster the consumption figure. Sulphur production in 1958 was down about 800,000 long tons, due not only to lower consumption, but also to increased imports and a cutback in stockpiling.

Nitrogen Supply Outlook

The excess of nitrogen capacity over current consumption should disappear and American supply and demand should come into balance by 1961, provided only those ammonia plants now in existence and ones currently under construction are operating at that time, according to a study issued last month by Jack Melnick, a New York consulting economist.

In his study, Mr. Melnick has projected future demand on the basis of consumption trends over the last decade. Since 1948, the use of nitrogen has increased in the U. S. by about 10 per cent a year, and the study indicates it should continue to grow at the same rate. Total nitrogen consumption will reach 4,176,000 tons by 1961, it is predicted.

Named To AP&CC Sales

The American Potash & Chemical Corp., Los Angeles, has named E. M. Kolb (left) assistant to the vice president and appointed A. J. Dirksen eastern general sales manager (right).

Mr. Kolb formerly was general sales manager of the heavy chemicals division and will continue to be in charge of the company's potash activities.

Mr. Dirksen had been general sales manager of the industrial chemicals division. Prior to joining AP&CC in 1953, he was with the Phillips Petroleum Corp. Both men will continue to operate from the company's New York offices.

•

Buys Phosphate Property

More than 1,200 acres of phosphate property near Elliston, Mont., have been acquired by the Bunker Hill Co. The phosphate could be used to supply Bunker Hill's proposed treble superphosphate plant, for which the company has land under option at Kennewick, Wash.

•

OM Sells McGraw Interest

The Olin Mathieson Chemical Corp., New York, has sold its interest in F. H. McGraw & Co. and has announced the completion of its program for disposing of operations and assets not related to its principal fields of activity.

•

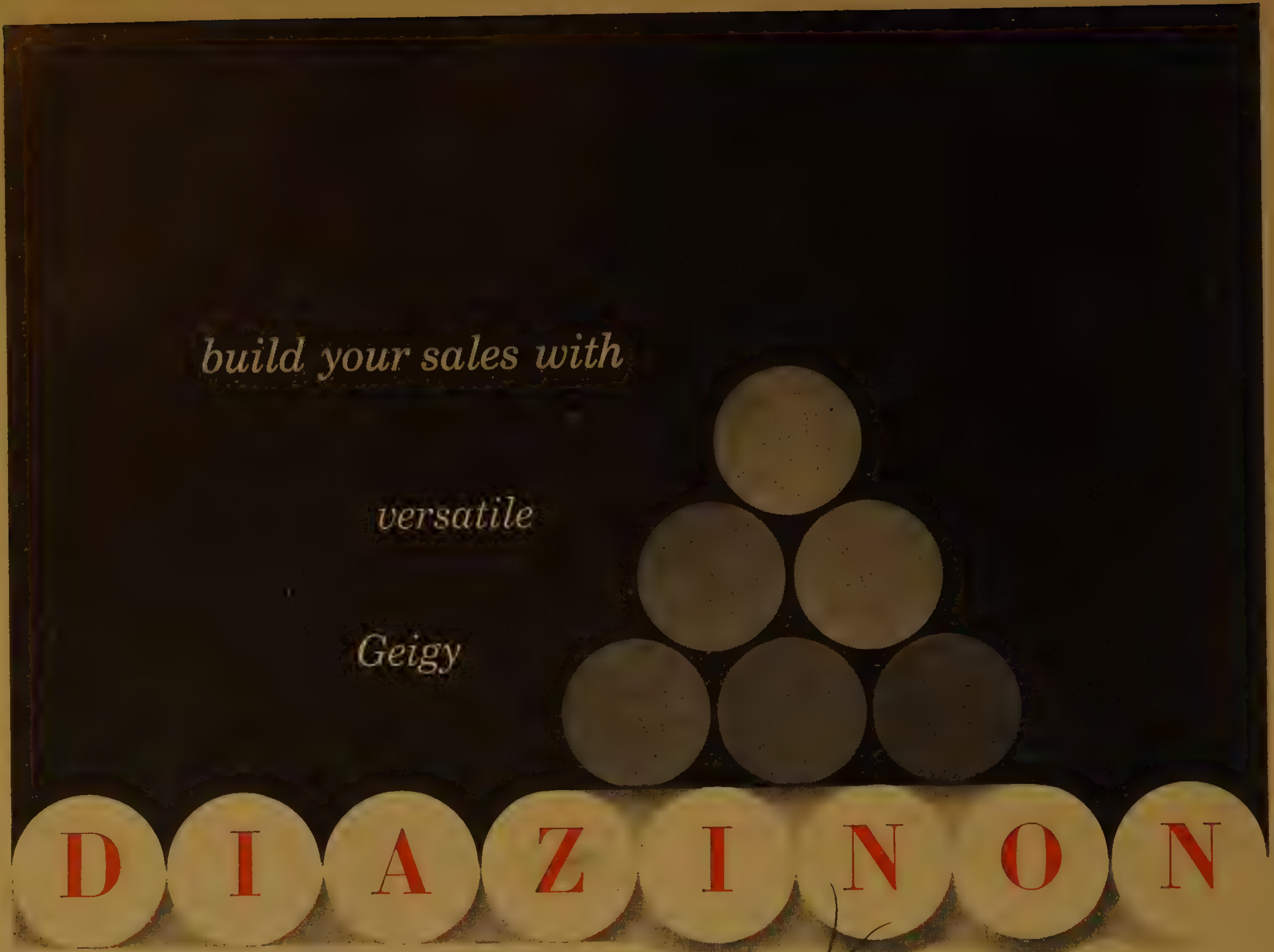
Joins Mississippi River Co.

Ronnie R. Wheat has joined the sales department of the Mississippi River Chemical Co., St. Louis, Mo. He will make his headquarters in Bowling Green, Ky.

•

Joins Pacific Coast Sales

The Pacific Coast Borax Co., division of the United States Borax & Chemical Corp., Los Angeles, has announced the appointment of Ralph Wall to its agricultural sales department at Jackson, Miss. Mr. Wall replaces J. M. Nunn who recently was transferred to the Los Angeles offices as a marketing specialist.



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Mr. Wall will cover the tri-state area of Arkansas, Louisiana, and Mississippi for the company. Before joining U. S. Borax, he had been with the sales department of Armour and Co.

•

Thayer Corporate Changes

The Thayer Scale Corp., Pembroke, Mass., in adopting a new organizational framework, has announced the appointment of Carl G. Peterson as president of Thayer Scale Corp. and Thayer Manufacturing Corp., a wholly owned subsidiary of Thayer Scale. Mr. Peterson had been sales manager of the firm since 1950.

•

Maxwell Joins Moyer

Dr. Kenneth E. Maxwell has joined the Moyer Chemical Co., San Jose, Calif., as technical director to be in charge of the company's research and development department. Dr. Maxwell had been in charge of the agricultural chemical development of the Monsanto Chemical Co. in the west.

•

SunOlin To Build Urea Plant

Construction of the SunOlin Chemical Company's $11 million urea plant at north Claymont, Del. is scheduled to start next month. The plant is expected to be in operation by the end of the year.

SunOlin, a joint subsidiary of the Sun Oil Co. and Olin Mathieson Chemical Corp., will use the Fauser-Montecatini process to produce urea. In this process, liquid ammonia and carbon dioxide gas are reacted at 3,000 pounds pressure and 370 degrees fahrenheit to form ammonium carbamate, which then decomposes to urea and water. Ammonia for the process will be purchased from Sun Oil Co.'s refinery.

The urea will be sold through Olin Mathieson's existing marketing organization which will act as exclusive sales agent for SunOlin. The plant will have a capacity of 73,000 tons per year and will be the fourth plant in the U. S. to use the Montecatini process.

Remove Aramite Tolerance

The Food and Drug Administration has announced that a tolerance of zero has been established for residues of Aramite in or on each of the following raw agricultural commodities: alfalfa, apples, blueberries, cantaloupes, celery, cucumbers, grapefruit, grapes, green beans, lemons, muskmellons, oranges, peaches, pears, plums, raspberries, soybeans (whole-plant), strawberries, sweet corn (kernels) and forage thereof, tomatoes, and watermelons. Aramite previously had a tolerance of 1 part per million.

The Food and Drug Administration said that its action was based on data from animal feeding studies submitted by the manufacturer, Naugatuck Chemical Division, U. S. Rubber Co., New York. The Naugatuck studies indicate that Aramite, when fed at levels as low as 500 parts per million, causes cancer in dogs, and, also, that Aramite is a carcinogen for the rat.

At the request of the manufacturer, and as provided by the Miller pesticide law, an advisory committee composed of scientists nominated by the National Academy of Sciences and appointed by the FDA considered the data from the feeding studies and recommended the zero tolerance.

A similar advisory committee in 1955 had reviewed an FDA proposal to establish a zero tolerance for Aramite and recommended that a tolerance of one part per million be established. This committee was the first such body appointed under the Miller law and it recommended that additional toxicity data on Aramite be obtained by the manufacturer and that the whole question be reviewed when such data became available.

In commenting on the FDA action, Naugatuck Chemical pointed out that Aramite is not banned from the market by the new ruling, but it must be used in such a manner as to leave zero residue on edible crops after harvest. The company is advising growers to use the chemical on edible crops only during the early growing season. Other uses for the chemical, such as controlling mites on cotton and ornamental shrubs, are not affected by the FDA decision.

•

To Head Miller Sales

Keith Sime has been named to the board of directors and elected vice president in charge of sales by the Miller Products Co., Portland, Oregon.

Mr. Sime has been Northwest district manager for the Chipman Chemical Co. for the past 16 years. He is active in the Western Agricultural Chemicals Association and presently is serving on its Northwest Legislative Committee. Prior to entering the manufacturing and sales field of agriculture, Mr. Sime was with the Montana Extension Service for eight years, spending four years each as County Agent in Baker and Billings, Montana.

•

11th Midwest Meeting

Fertilizer research reports, an experience summary of a crop production potentials program, and a review of Soviet agriculture will be features of the 11th annual Joint Meeting of Midwestern Agronomists and Fertilizer Representatives in Chicago, under the auspices of the Midwest Regional Office of the National Plant Food Institute.

Another feature will be the premiere showing of an Institute color film, "Cash in on Grass". The meeting will be held at the Edgewater Beach Hotel, Feb. 12 and 13. Dr. W. P. Martin, head of the University of Minnesota's soils department, will be chairman and Dr. C. E. Smith of the University of Missouri will be co-chairman.

•

US To Aid Yugoslavia Plant

An agreement was announced last month by the U. S. State Department to finance about half the cost of a $45 million nitrogenous fertilizer plant to be built by Yugoslavia. The plant is one which Soviet Russia had previously agreed to finance but withdrew after its political difficulties with the Tito government.

The plant is designed to produce about 360,000 tons annually.

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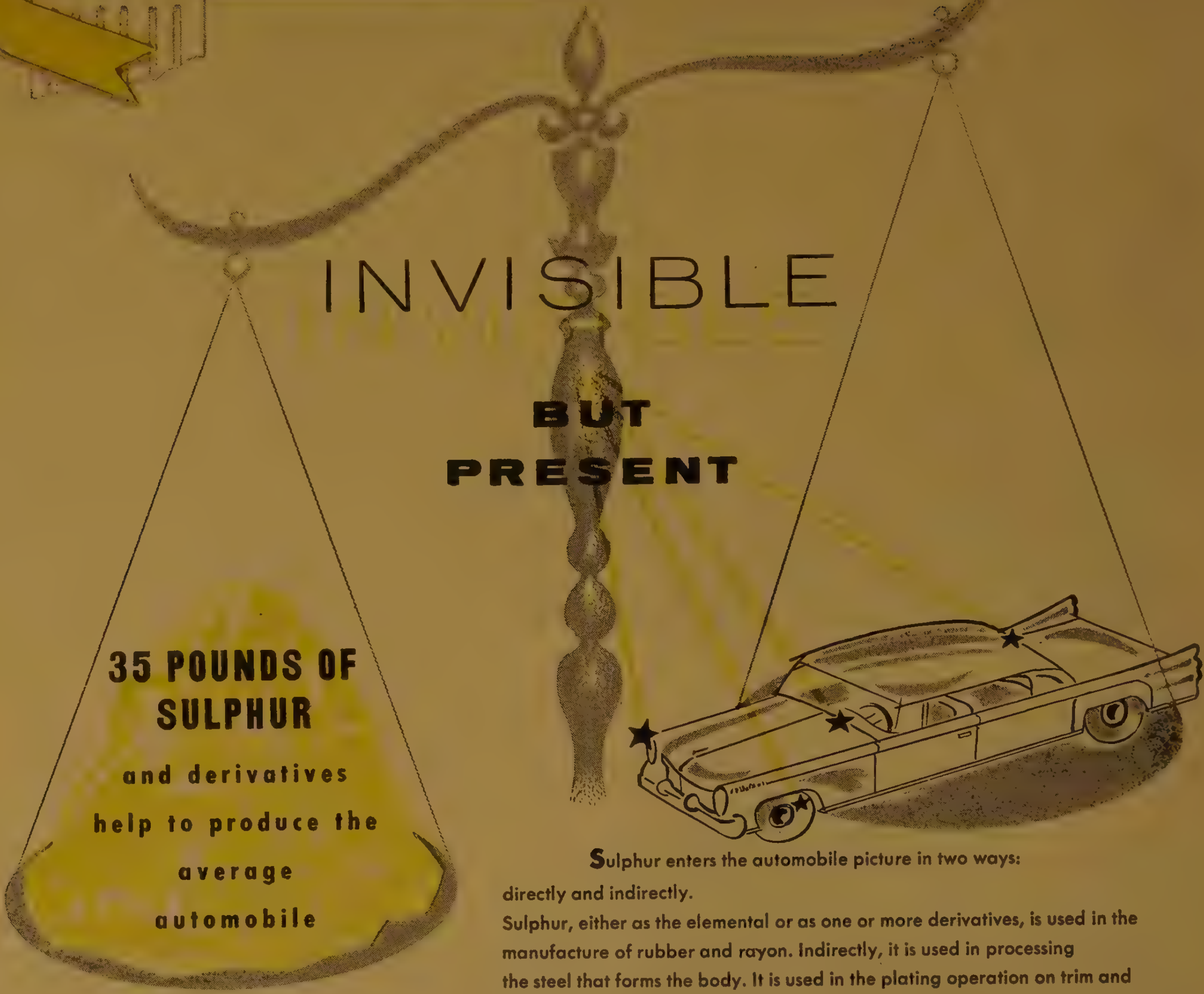

Sulphur enters the automobile picture in two ways: directly and indirectly.

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1959 Recommendations Include Systemics for Cattle Grubs; Maneb for Diseases —Reports from N. C. Pesticide School

A GROUP of more than 175 dealers formulators, manufacturers, and others interested in agricultural chemicals met Jan. 14-15 at North Carolina State College for the eleventh annual pesticide school.

Dr. D. E. Wolf of E. I. Du-Pont de Nemours Co., Atlanta, Ga., was the keynote speaker, discussing the acceptance of agricultural practices. According to Dr. Wolf, growers accept new ideas because they fit a need, want or desire.

Reports show that farmers' best source of information is other farmers. Once farmers learn about new practices, they turn to agricultural agencies for additional information. "We must," he urged, "keep in step with the farmers in helping them solve problems and supply their needs."

The 1959 program opened in the College Union Building with Dr. D. E. Ellis, head of the college's Department of Plant Pathology, presiding. Dr. H. B. James, director of instruction for the school of Agriculture which conducted the program, officially welcomed the pesticide representatives. Dr. James commended the more than 400 teaching and research staff members in agriculture, who worked full or part-time to provide the latest research findings.

"We now have a new concept of Agriculture," he reported. "Agriculture includes three important groups of people—the farmers, industry, which provide supplies and services to the farmers, and those who store, package, and market farm products."

The program was divided into three main sections: plant pathology, weed control and entomology. The following are some of the highlights of the papers presented to the school:

Nematode Control

Dr. C. J. Nusbaum discussed nematode control for tobacco. He urged that immediately after harvest, tobacco stalks be cut and the roots plowed out. This reduces build-up of nematodes in the fall, and subsequent winter survival. He also observed that if a previous tobacco crop showed no evidence of nematode damage or only a slight amount, and if a suitable alternate crop has been grown, it should be safe to plant a new crop without soil treatment. On the other hand, he said, if an appreciable amount of nematode damage is found in the previous tobacco crop, it would be advisable to fumigate the soil, even though the land had been out of tobacco for one season. If soil treatment is used, particular attention should be given to proper application of recommended dosages under satisfactory treatment conditions.

Dr. C. B. McCants discussed the influence of soil fumigation on the response of tobacco to various forms of nitrogen. Basing his report on investigations using methyl bromide, Shell DD, Dowfume W-85 and Dorlone, Dr. McCants stated that each of the fumigation materials has been shown to reduce nitrification under both laboratory and field conditions. On the fumigated soil, the yield and quality index of tobacco generally increased with increasing percentage of the total nitrogen applied in the nitrate form.

R. P. Upchurch, field crops - research and general chairman of the 1959 Pesticide School; D. E. Wolf, E. I. Du-Pont de Nemours Co., Atlanta, Ga., keynote speaker for the program; and D. E. Ellis, head of North Carolina college's Plant Pathology, who served as chairman of the opening session of the two-day school.

Stem and Root Rot Control

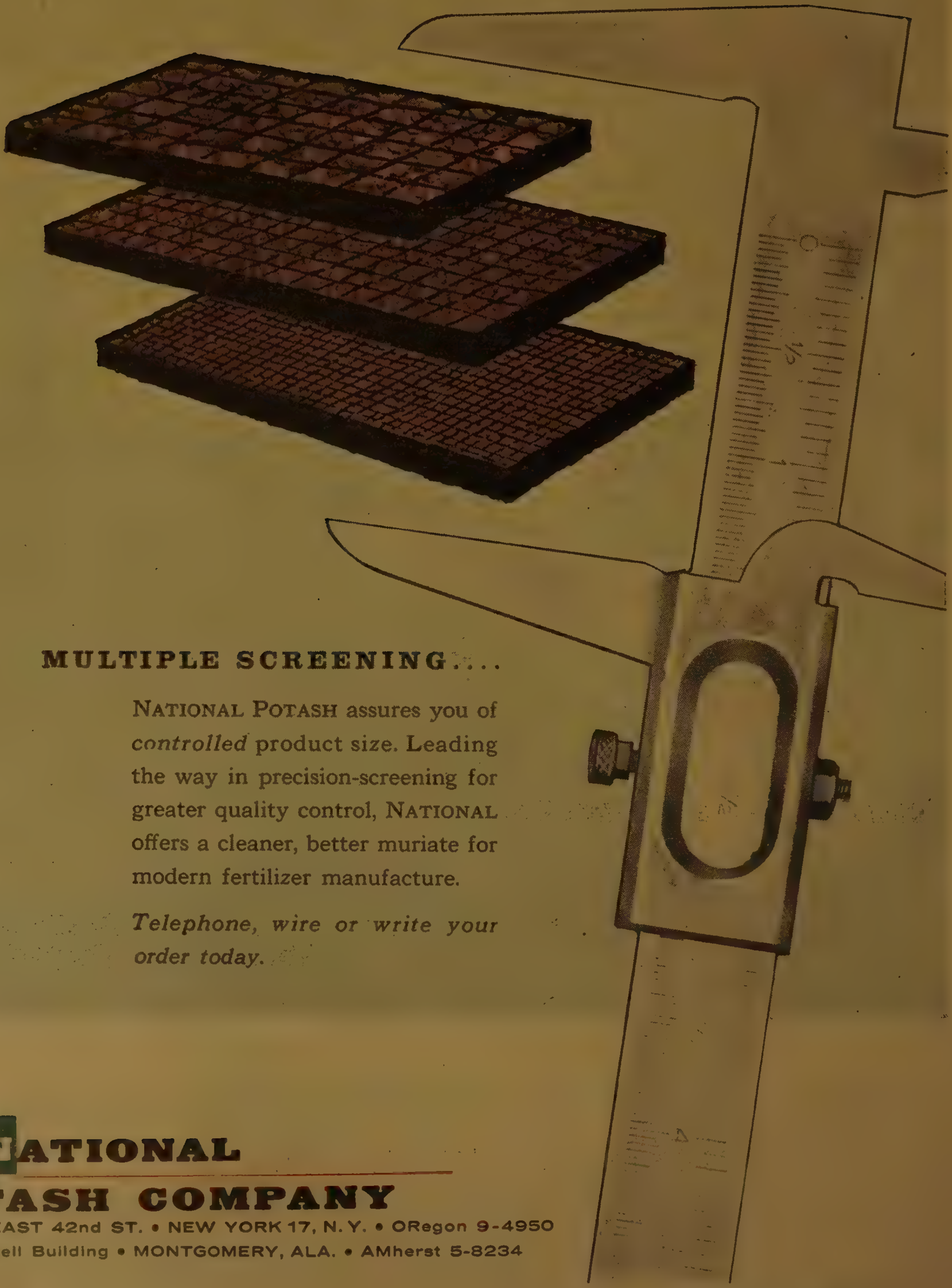
A report on Southern stem and root rot control on peanuts was given by J. C. Wells, extension plant pathologist.

Results of research and demonstration work have shown that losses due to Southern stem rot disease may be reduced by: (1) deep plowing to bury old plant refuse, venting pathogen build up; (2) flat cultivation, avoiding burying green leaves so that they become more susceptible; (3) leafspot control preventing accumulation of leaves around the base of the plant where the pathogen grow on them; and (4) rotation with cotton, corn, grain sorghum, and small grain. Losses have also been reduced by using the new soil fungicide, Terraclor.

Vegetable Fungicides

Dr. W. W. Winstead reviewed results with vegetable fungicides. Maneb, Dyrene, and Phaltan spray and dust treatments for the control of both early blight and gray leaf spot all gave increases in the yield of marketable fruits in tests in Eastern North Carolina. Tests in western North Carolina gave similar results. In both tests, sprays were more effective in controlling the diseases than were dusts.

The Measure of Quality



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In a test for the control of Anthracnose or ripe rot of red sweet peppers, sprays were also more effective in disease control than were dusts.

Maneb was added to the list of fungicides recommended for the control of downy mildew on cucumbers and for the control of late blight on tomatoes.

Dr. J. N. Sasser presented a report on sting nematode in North Carolina, which was prepared in cooperation with Dr. W. E. Cooper and Prof. Wells. Control of this pest in the peanut area by rotation is difficult since most of the crops normally used in a peanut rotation are susceptible. Soil fumigation, however, appears to be practical and economical.

Entomological Research

Dr. Clyde F. Smith covered trends in entomological research, stating, "We are looking for the answer as to why insects die, and of equal importance, why do we have insects and from whence do they come."

Another phase of work is the effect of insect pathogens on insects and the ultimate control of the pest species. This is a relatively new field, but one which undoubtedly will be of importance. The possibility of making use of insect resistance in plants is a neglected field, which is being given more attention. The use of insect pathogens and resistant plants should enhance the control obtained with chemicals, which in the long run will be of benefit both to the insecticide manufacturer and the farmer.

Research findings on vegetable insects were discussed by Dr. Charles H. Brett. Insecticide tests on the Mexican bean beetle show some new dust materials to be very effective. Namely, 1½% Sevin, 3% Rogor, 2% Trithion, and 4% Diazinon. Sevin has been included in the 1959 recommendations.

Residue tests with 1½% Sevin dust at 30 lbs. per acre on snap beans and collards showed no detectable residue after four days. Trithion and Diazinon were very effective in control of the potato leafhopper on snap beans.

Tests on cabbage loopers showed 20% toxaphene dust continued to be consistently more effective than any of the other materials. Other dusts which gave good control were 4% Thiodan and 2% Endrin.

Good control of the harlequin bug on collards was obtained with 1½% Sevin, 2% Trithion, 4% malathion, 3% Diazinon, 3% Rogor, and 4% Thiodan.

Spray tests for corn earworm control were made on a "resistant" and a "susceptible" variety. The resistant variety showed 17% control with one application and 50% control with two applications. No measureable control was obtained on the susceptible variety with the same treatment.

Fly Control

Dr. R. T. Gast's topic was the house fly resistance to DDT and Malathion in North Carolina. Adult house flies were collected from forty locations in the State. Offspring of these flies, reared in a laboratory, were tested to determine the resistance level of each population to DDT and malathion.

All fly populations showed a definite resistance to DDT, ranging from fifty to two hundred times that of the susceptible strains. Resistance to malathion was not as general, or as great as to DDT; however, nearly all populations showed some degree of resistance to malathion.

According to Dr. W. V. Campbell, who reported on grain protectants in wheat, malathion (premium grade) is effective in protecting stored wheat from insect attack for many months.

This material should be applied to the stream of grain as it is being binned. One pint of 57% emulsifiable concentrate (premium grade) mixed with 5 gallons of water or 60 pounds of 1% malathion on flour will treat 1,000 bushels of grain. If the recommended rates of application are followed, there should be no harmful insecticide residues. Malathion as a grain protectant is economical, safe to apply, has good residual properties and is effective in any type of grain storage facility.

Concluding the program, Dr. George D. Jones summarized the highlights of the 1959 recommendations. He added the use of systemic insecticide control for cattle grubs.

All of the research findings and current recommendations are contained in the 1959 Pesticide Manual, prepared for those enrolled in the school.

Extra copies are available as long as the supply lasts for $1.00 per copy or 75 cents for four or more copies. To obtain the manual, write the Division of College Extension, Box 5125, State College Station, Raleigh, N. C.

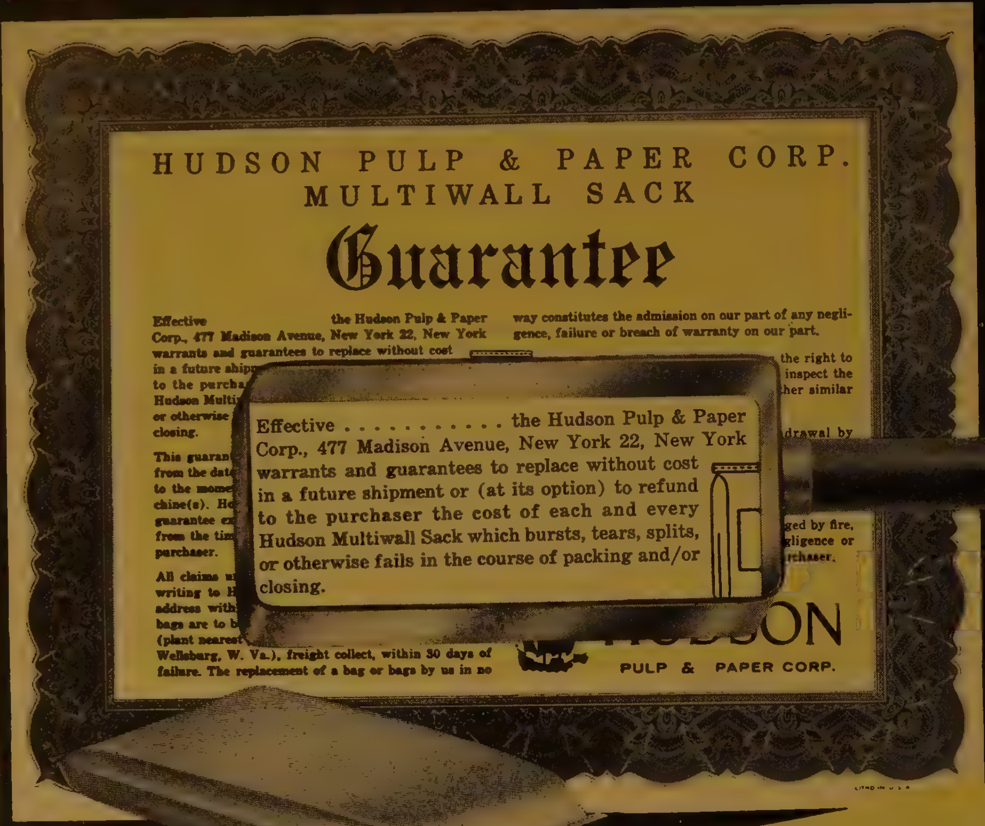
●

Tree Fertilization Study

North Carolina State College's School of forestry and its Experiment Station and the Allied Chemical Corp. have begun a study of forest fertilization.

The study will attempt to answer such questions as: Under what conditions will it pay to fertilize trees? What is the minimum amount of nutrients a tree can have in its foliage without being limited in growth by "hunger"? Is it possible to tell how much and what analysis Fertilizer a tree needs by checking the nutrient level of soil and foliage? And can you trigger a growth response by applying the fertilizer these tests indicate the tree needs?

Project leader for the study is Dr. T. E. Maki, head of the college's department of forest management. Dr. Harvey J. Stangel, chief agronomist of the Nitrogen Division, Allied Chemical Corp.; Dr. Ralph McCracken of the Soils Department, N. C. State College; and Dr. David Mason of the Department of Experimental Statistics, are serving as advisors for the project.



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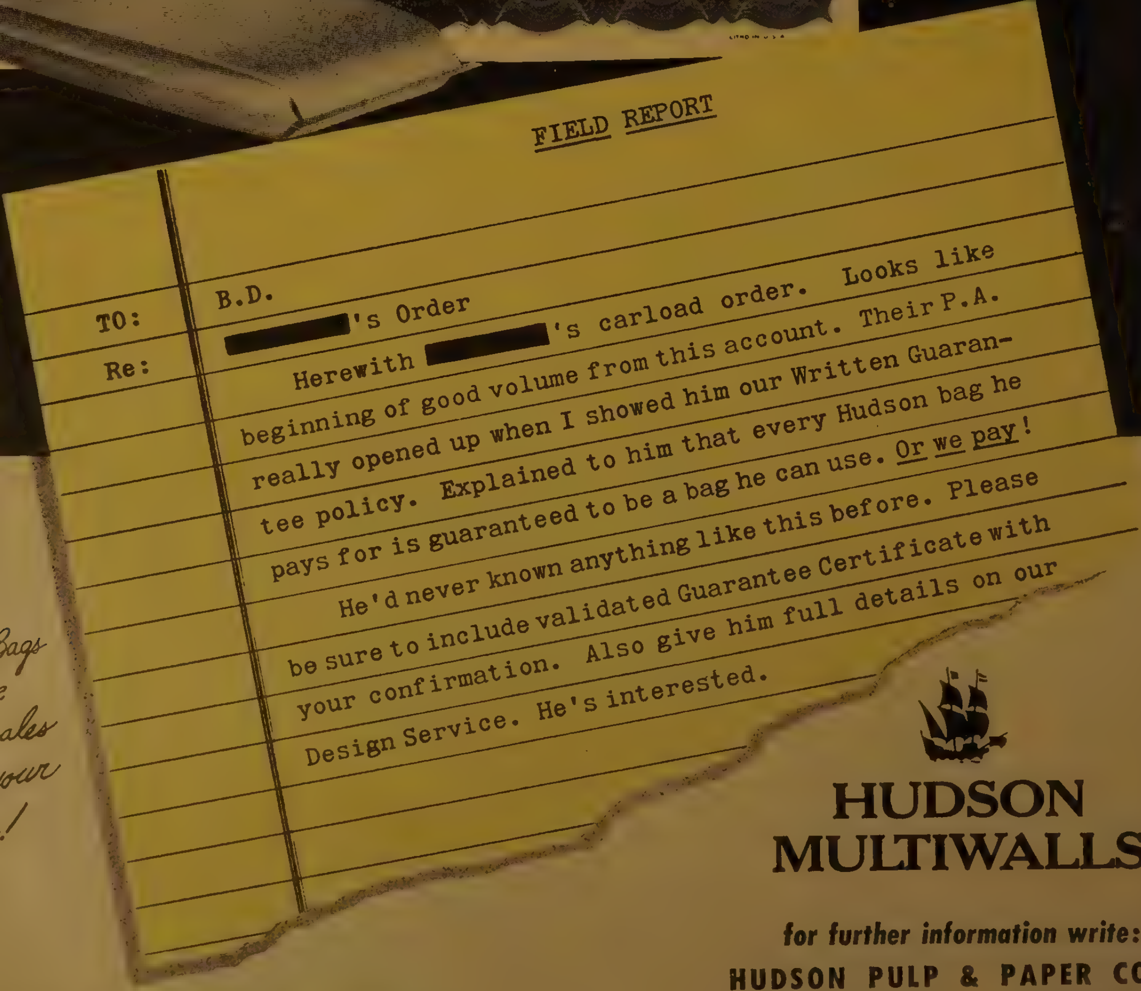

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QUARANTINE

(*From Page* 29)

bitter melons, Cavendish bananas, cucumbers, papayas, pineapples (other than the variety smooth Cayenne, which is immune to fruit fly attack), string beans, and zucchini squash. It has generally shown a wide plant tolerance (Lindgren and Sinclair 1951; Claypool and Vines 1953; Pratt *et al.* 1953; and Sinclair and Lindgren 1953). Tomatoes, artichokes, eggplants, peppers, and some other products have shown some intolerance (Pratt *et al.* 1953).

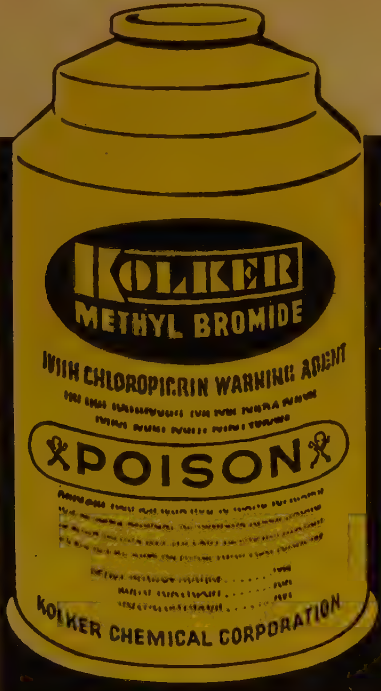
Ethylene dibromide has also found practical use in the treatment of West Indian Mangoes for West Indian fruit fly control (Richardson 1952b), Manila mangoes and citrus from Mexico for Mexican fruit fly control (Shaw and Lopez 1954, McPhail unpublished report); and was used extensively in the recent Mediterranean fruit fly eradication program in Florida. Dosages of ½ to 1 pound or more have been used depending on the commodity. This fumigant has also been approved by California for treatment of cherries infested with the cherry fruit fly (Jones 1955), and it has been found very effective against the apple maggot in apples (Richardson 1955).

The short treatment time, low dosage, and wide commodity tolerance are important advantages of this fumigant (Richardson 1958). However, the dosages used for fruit flies are not so effective against most other insects. Thus far all practical fumigation with ethylene dibromide has been at 70° F. or above, but it has been approved recently at higher dosages (PQ 608) for use at 55° for the West Indian fruit fly (Richardson and Roth 1956). Balock and coworkers (unpublished) also found it effective at temperatures below 70° against the oriental fruit fly. The fact that the liquid solidifies at 50° may put some restriction on its use at lower temperatures, although it proved effective against oriental fruit fly infestations in papaya in 2-hour fumigations at 40°.

Tolerances for the small bromide residues in some fumigated commodities have already been approved by the U. S. Food and Drug Administration, and further work is being done.

In recent years injections or dips of ethylene dibromide solution or emulsions have been used for treatment of soil balls around the roots of nursery stock for shipment out of Japanese beetle quarantined areas (Chisholm 1952; Fleming, Chisholm, and Cronin 1958). Ethylene dibromide is also an effective soil fumigant for nematodes, but generally at high dosages not tolerated by plants. Ethylene dibromide in mixture with ethylene dichloride, methyl bromide, and/or other chemicals is also used as a grain fumigant.

It was found in 1953 (McPhail unpublished), that dips of dilute ethylene dibromide solutions were



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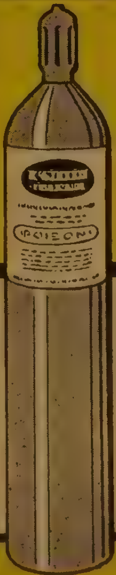

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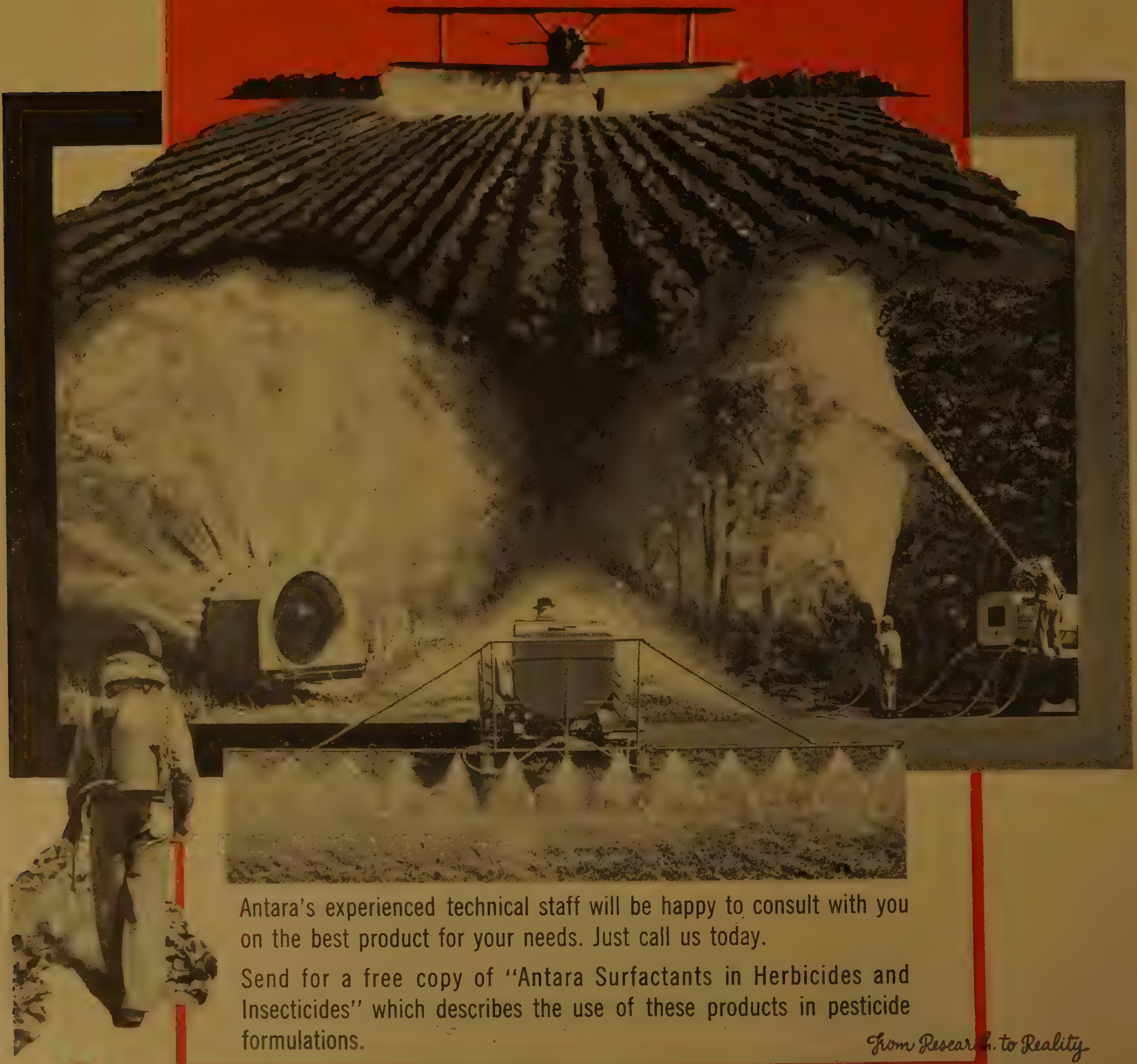

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In Canada: Chemical Developments of Canada, Ltd., Montreal effective against various stages of the Mexican fruit fly in fruit. Later that year, the same treatment showed excellent promise for destroying fruit fly infestations in Hawaiian papayas and other fruits. Twenty minute dips in one part of ethylene dibromide to 20,000 parts of water by volume at 115° F. have been shown to be completely effective against the immature stages of the oriental fruit fly, the melon fly, and the Mediterranean fruit fly in papaya (Hinman, Balock, and Burditt unpublished). At the same time, the high temperature of the dip prolongs the shelf life of papayas by delaying the development of anthracnose and storage rots (Akamine and Arisumi 1952).

Hydrocyanic Acid Fumigation

HYDROCYANIC acid gas (HCN, hydrogen cyanide) is one of the oldest quarantine fumigants. Buckton reported on its efficiency against insects in 1854. Coquillet (1891) found it very effective against scale insects on citrus, and used it extensively in tent fumigation of orange trees. This procedure still has some usage. The fumigation of imported cotton bales with HCN under vacuum to prevent the entry of the pink bollworm was among the earliest quarantine fumigation treatments developed in this country (Sasscer 1915). A 25-inch mercury vacuum is first drawn in the fumigation tank. HCN is then applied through a high-temperature vaporizer at the rate of 2½ pounds per 1000 cubic feet. The vacuum is then released to approximately five inches (about 25 inches mercury of absolute pressure) by allowing fresh air to enter. The fumigation under partial vacuum is then continued for two hours. In the early years, the HCN gas was evolved by mixing sodium cyanide and sulfuric acid. Later, liquid HCN became available and has been in use since. Many thousands of bales of cotton were fumigated in this way each year after the treatment was developed in 1915.

Recently, however, its use has fallen off some owing to elimination of this requirement for cotton bales compressed to at least 20 pounds per square inch and assigned to mills in certain non-cotton growing areas. HCN is used occasionally to fumigate contaminated freight cars entering the United States from Mexico.

Hydrocyanic acid is a colorless, flammable liquid, boiling at 26° C. Gas concentrations of 5.6 to 40 per cent are explosive, but fumigation concentrations are usually below one per cent. Nevertheless, it is well to insure that no spark or flame is present inside the fumigated structure. HCN gas has a distinct odor like that of bitter almonds. It is lighter than air, so injection is usually made into the lower part of the fumigation chamber. Where the vacuum-release procedure is used, good distribu-

(*Continued on Page* 00)

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DĪMŌN can be used efficiently and economically in producing most high analysis formulations, and is particularly suited for ultra high analysis.

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HIGH ANALYSIS FORMULATIONS

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tion is generally obtained, with the large volumes of air brought in when the release valve is opened. In fumigations under atmospheric pressure, HCN may also be applied either by means of discoids in which the liquid HCN is absorbed on some inert material or by calcium cyanide dust. HCN gas is given off as soon as the impregnated discoid or calcium cyanide dust is exposed.

Before the development of methyl bromide as a fumigant, HCN was used at either atmospheric pressure or under partial vacuum for the treatment of several types of dormant nursery stock and other plants, especially to control surface-infesting insects, but generally plant tolerance was low or nonexistent. Furthermore, HCN is very soluble in water and the presence of moisture (often in plant or similar shipments) tends to reduce the gas concentration. For these and other reasons, such as its high toxicity to man and its lower penetrative ability, for use on nursery stock and other plants, it has been largely replaced by methyl bromide. For a few purposes, it still has some practical application, such as in the treatment of citrus fruit for scale or thrips control. A dosage of 25 cc. of liquid HCN is used per 100 cu. ft. (equals approximately ⅜ pound per 1000 cubic feet) with a 1-hour exposure, under atmospheric pressure (Arizona State regulation). California has a similar treatment for use on avocado for Latania scale control.

(To Be Concluded)

Pan American Moves Offices

The principal office of the Pan American Sulphur Co. has been moved to Houston, Texas, from Dallas to combine with the Houston office in new quarters in the Bank of the Southwest building.

PASCO conducts mining operations at Jaltipan in southern Mexico, and has storage and shipping facilities in Coatzacoalcos, Mexico, and in Tampa, Fla.

Heads Chipman Ltd.

J. H. D. Ross has been elected president of Chipman Chemicals, Ltd., Hamilton, Ontario. He succeeds W. H. Moyer, who has been named chairman of the board of the Company.

Mr. Ross had been general manager from the time that Chipman Chemicals Ltd. was reorganized in 1956 to merge its operations with the pesticides operations of Canadian Industries Ltd. As president, he will continue to be responsible for the general management of the company's affairs.

USPP Di-MoN Fertilizer

The U. S. Phosphoric Products Division, Tennessee Corporation, Tampa, Fla., has announced the construction of a plant in East Tampa for the production of a modified diammonium phosphate, to be marketed under the trade name of "Di-MoN."

The new product is granular material, 95 per cent of which is sized in the 6 to 16 mesh range, produced for use in mixing, granulating, and for direct application to the soil. Made from wet process phosphoric acid, the plant food content of the new product is approximately 95 per cent water soluble. Its analysis is 18-46-0.

The new plant utilizes a process developed by U. S. Phosphoric. The product has been produced in pilot plant qualities on a continuous basis for the past year and a half. The new plant is expected to be in operation April 1, 1959. Di-MoN is said to have been used successfully in complete granulation units, batch type granulators, and dry mixing, in commercial quantities.

IMC Lawn And Garden Dept.

The International Minerals & Chemical Corp., Skokie, Ill., has begun operation of a lawn and garden department in its Plant Food Division.

The department is concentrating on the promotion of a new lawn fertilizer called "Thrive," which uses a slow-release feature to provide year-round feeding. Jack G. Eisinger, formerly Chicago district manager for the hardware division of Black and Decker, has joined IMC to be sales manager for the new department. The product was market-tested last spring in South Bend and Fort Wayne, Ind., and in Rockford, Ill., and will be introduced this spring to expanded midwestern markets, including greater Chicago and Milwaukee.

NSC Fertilizer Chairman

George L. Pelton of the Smith Agricultural Chemical Co., Columbus, Ohio, has been elected general chairman for 1959 of the Fertilizer Section, National Safety Council.

Elmer C. Perrine, Nitrogen Division, Allied Chemical Corp., New York, has been chosen vice president and Ansell I. Raney, Phillips Chemical Co., Bartlesville, Okla., was named secretary.

Heads Midwest Sales

Edison H. Shaw has been named Midwestern regional sales manager of the Industrial Chemicals Division, Pittsburgh Coke & Chemical Co. Mr. Shaw had been in charge of the company's Cleveland office and formerly was associated with the Allied Chemical Corp.

Change In Sinclair's Name

The name of Sinclair Chemicals, Inc., New York, has been changed to Sinclair Petrochemicals, Inc. The company is a wholly owned subsidiary of the Sinclair Oil Corp.

Nebraska Weed Meeting

The Nebraska Weed and Pest Control Conference will be held March 4 and 5 at Fonner Park in Grand Island, Nebraska. Between 600 and 700 delegates are expected to attend and more than 25 chemical and equipment companies will sponsor exhibits..

The meeting is open to the public and this year's theme is "Helping the Farmer to Help Himself." Speakers will talk primarily on insect and weed control along with new chemical developments.

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...new source of Fluorides

Fluorides from domestic raw material by a basic new process assures stable, reliable availability of these important chemicals. Long-term supply contracts.

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Here's what they're saying about

Terraclor®

SOIL FUNGICIDE

—it's in demand everywhere!

A California distributor:

Terraclor has done the job on beans for root and stem rot. It's meant improved stands and increased yields.

An Arizona cotton grower:

I'm all for Terraclor. Matter of fact I wouldn't take the chance of not using it for control of damping-off.

Terraclor has the economics

Plan now for greater profits in '59

Share in this new, fast-growing market

Terraclor pays off on:

COTTON: 25-30% of total disease losses are caused by seedling diseases. Replanting costs $5-15.00 per acre, plus loss of pre-emergence herbicide previously used. Terraclor may increase yields and return the grower more than 15 times his investment through uniform stands of better grade cotton.

CABBAGE, CAULIFLOWER: Severe club root infection can take a field out of crucifer production entirely. Terraclor control has provided 3-5 ton per acre increases for a return of 10-30 times the investment. Terraclor also controls black root or wire stem.

PEANUTS: Faced with the threat of a 50-60% crop loss, growers can realize Terraclor-increased yields of as high as 350-500 lbs. per acre of clean peanuts—free from soil. This return is many times the cost of the chemical invested for control of stem and root rot (Southern blight).

BEANS: Root and stem rot losses run as high as 30-40%. Terraclor may increase yields by 200-300 lbs. per acre and return growers 10-15 times the cost of treatment. Terraclor also controls white mold.

A Suffolk County, N. Y. distributor:
We're transplanting healthy cabbage now that we're using Terraclor to control club root.
A North Carolina peanut grower:
I got some of the best peanuts I ever made where I tried Terraclor for stem rot.
A Texas cotton pathologist:
Terraclor tests increased yield 33% and net return $25 per acre.
A Georgia county agent:
On recent tomato tests for stem rot you could tell to the row where Terraclor was left out of the transplant water.

TOMATOES, PEPPERS: Stem rot (Southern blight) can cut production 30-60%, depending on severity. Terraclor treatment can return 10-20 times the investment by increasing yields ⅓ to ½.

LETTUCE: Growers have lost 25-50% of their crop to leaf drop and bottom rot. Terraclor may increase yields by ½ for a profit far exceeding the chemical cost.

Also:

POTATOES	(Scab, Rhizoctonia)
WHEAT SEED	(Common Smut or Bunt)
GARLIC	(White Rot)
ALFALFA, CLOVER	(Crown Rot)

FORMULATORS—Get complete information on Terraclor (PCNB) for control of soil-borne diseases. Terraclor is available as 75% wettable powder and technical grade. Call or write today.

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Illinois Natural History Survey Marks 100th Year

The Illinois Natural History Survey last year celebrated its 100th anniversary with a seminar held on the University of Illinois campus in Urbana. Speakers at the seminar included (left to right): Dr. C. F. Hottes, early botanist of the Survey and instructor in botany at the university; Dr. J. J. Davis, an early Survey worker and former head of the department of entomology at Purdue University; Dr. A. G. Vestal, retired Survey plant ecologist; and Mrs. Ethel Forbes Scott, daughter of Dr. Stephen A. Forbes, a founder of the Survey.

•

Fruit Pest Studies Needed

Research to improve control of insect and nematode pests of fruits is a high priority need, according to members of the U. S. Department of Agriculture's Deciduous Fruit and Tree Nut Research and Marketing Advisory Committee who held their annual meeting in Washington, January 5 to 8.

Studies are needed to screen insecticides that have a broad range of effectiveness, are less hazardous to handle than some now being used, and can be used up to harvest time without leaving residues, the committee said. Better lures and traps also are needed, and better methods of biological insect control should be developed.

Dr. J. Harold Clarke, a Long Beach, Wash., commercial nursery operator and chairman of the committee, presided at the meeting.

•

Carbide Names Three

Norman R. Cox, Dr. Robert G. Kelso, and Dr. Fred W. Stone have been appointed group leaders in the development department of the Union Carbide Chemicals Co., a division of Union Carbide Corp., New York.

Mr. Cox will work on the process development on a pilot-plant scale, and Dr. Kelso and Dr. Stone will work on process and product development.

2nd Hanna's Handbook

A second edition of Hanna's Handbook of Agricultural Chemicals has been published which contains over 450 pages describing more than 1,000 commercial chemicals and miscellaneous items used in the agricultural industry.

Included in the handbook are colored charts on spray compatibility and weather factors in spraying and dusting.

•

Woodruff Plant Is Sold

The warehouses and packaging plant of the W. H. Woodruff Co., Basin, Wyoming, has been purchased by the Greater Wyoming Mineral Corp., Thermopolis, Wyo., to be converted into an alfalfa dehydrating and pelleting and soil conditioner blending plant.

•

Elected By Chase Bag

Elliot K. Ludington Jr., left, has been elected executive vice president of the Chase Bag Co., New York. He had been vice president in charge of the company's Paper Bag Division. Mr. Ludington is succeeded in that post by R. H. Ayers, right, formerly sales manager of the division.

In other personnel moves by the company, Francis H. Ludington Jr. was named vice president and treasurer, W. N. Brock was elected vice president and director of sales, and John A. Brewster was elected vice president—director of West Coast operations.

E. K. Ludington

R. H. Ayers

Move Dorr-Oliver Operations

The filtration engineering and development operations of Dorr-Oliver, Inc., Stamford, Conn., have been moved from Oakland, Calif., to the company's new international headquarters in Stamford.

•

New Chemical Tools

Chemical pied pipers which will lure insects away from their destructive work were one of the possibilities for future agricultural chemicals development offered by Dr. Max T. Goebel, research director for the Du Pont Company's Grasselli Chemicals Department, at the California State Extension Conference in Asilomar, Calif., Jan. 15.

Dr. Goebel also suggested that within two decades farmers may be promoting livestock growth with tranquilizers, and combatting vagaries of weather and climate by chemical control of the normal growth processes of crops. This could achieve results in frost and drought resistance, root growth, fruitfulness and rapid ripening, which have heretofore been tackled by the slow, painstaking process of plant breeding.

•

Connecticut Station Moves

Staff members of the oldest agricultural experiment station in America moved into the newest experiment station building when the Connecticut Agricultural Experiment Station recently occupied the Slate Laboratory on the station grounds at 123 Huntington St., New Haven.

•

Otis Heads Foreign Sales

Chester E. Otis has been appointed to the newly-created post of sales manager, agricultural products, for Dow Chemical International Ltd. S.A., a subsidiary of the Dow Chemical Co., Midland, Mich.

•

Named Sales Engineer

George T. Henderson has been named sales engineer for the Los Angeles territory of the recently expanded technical products division of the Mine Safety Appliances Co., Pittsburgh, Pa.

Del-Mar-Va Group Elects

Nash Strudwick, Wm. B. Tilghman Fertilizer Co., Salisbury, Md., has been elected president of the Del-Mar-Va Peninsular Fertilizer Assn. for 1959. The group's new vice president is William Blank, Worcester Fertilizer Co., Snow Hill, Md. John S. Neild Jr., Dorchester Fertilizer Co., Cambridge, Md., is secretary and Bond Truitt, Worcester Fertilizer Co., is treasurer.

The retiring president is James R. Ford of the Warner W. Price Co., Smyrna, Del.

•

Named Sales Engineer

John W. Moser has been named sales engineer for the Kansas City, Mo., territory of the Technical Products Division, Mine Safety Appliances Co., Pittsburgh.

Mr. Moser will provide design assistance and counsel on the installation and maintenance of instruments and process controls for industry in the area. He also will handle sales and engineering service for space filters, ventilation equipment, and liquid oxygen converters.

•

Joins Rutgers Staff

Dr. Henry W. Indyk has been appointed associate extension specialist in farm crops at the College of Agriculture, Rutgers University, New Brunswick, N. J. He had been assistant professor in agronomy at the Univ. of Delaware.

•

Hercules Elects Hogg

Fred Hogg, general manager of the Naval Stores Department of the Hercules Powder Co., Wilmington, Del., was among five men elected to the company board of directors last month. Others elected were Edward G. Crum, Dr. John H. Long, Henry A. Thouron, and J. H. Tyler McConnell.

•

Anderson Joins Geigy

Vernon E. Anderson has joined the sales staff of Geigy Agricultural Chemicals, division of Geigy Chemical Corp., Ardsley, N. Y. He represents Geigy in the states of Wyoming, Colorado, Nebraska, Kansas, and Missouri.

Mr. Anderson formerly was assistant professor of biology at Buena Vista College, Iowa. His headquarters are in Kansas City, Mo.

•

Rename Fulton Company

The Fulton Bag & Cotton Mills, Atlanta, Ga., has changed its name to Fulton Cotton Mills, Inc. Clarence E. Elsas, president, said that the change was made to more effectively describe Fulton's present and future operations.

Fulton Cotton Mills reportedly is concentrating its efforts to produce and finish industrial fabrics. It ceased making textile bags last December.

•

Fertilizer Safety Meeting

The Fertilizer Section of the Southern Safety Conference will meet in Asheville, N. C., on March 2 and 3. Among the speakers will be Deane Buddorff, Hercules Powder Co., Wilmington, Del.; A. P. McIntosh, Florida Industrial Commission; Dr. Richard Y. LeVine, Olin Mathieson Chemical Corp., New York; and W. G. Alligood, American & Afrid Mills, Inc., Mount Holly, N. C.

•

AP&CC Plant Producing

A new plant of the American Potash and Chemical Corp. at Hamilton, Mass., began production last month of 15,000 tons of sodium chlorate per year, with provision for future expansion as required.

Dibrom LD50 is 1110 mg/kg

We wish to correct an error in the December issue of *Agricultural Chemicals*, page 36, 1958, which carried a review of the organic phosphate insecticide Dibrom, offered by California Spray Chemical Corp.

A typographical error indicated the acute dermal LD50 on rats is 110 mg/kg. This is incorrect. The LD50 is 1110 mg/kg.

Plan Israeli Plant

The phosphate deposits of the Negev Desert and the potassium salts of the Dead Sea will be used in a fertilizer plant to be built on the outskirts of Haifa, Israel. The plant will get sulphur from abroad and hydrogen from the Haifa Oil Refinery.

The Israeli government and private capital will build the plant.

•

Addresses British Weed Conf.

R. H. Beatty, agricultural chemicals research director for Amchem Products, Inc., Ambler, Pa., presented a paper on "Herbicides and the American Farmer" before the fifth British Weed Control Conference held at Brighton, England, Nov. 4 to 6.

Mr. Beatty, a past president of the Weed Society of America, discussed some of the newest developments in American chemical weed control and summarized current procedures in the use of herbicides with vegetable crops. Mr. Beatty said that American farmers have benefited tremendously from the remarkable cooperation between academic and industrial herbicide research groups. They also benefit from cooperation between British and American research workers, and it is expected that this will continue and increase, to the advantage of all, he said.

•

Census Forms Mailed

The United States Department of Commerce's Bureau of the Census last month mailed report forms to all establishments which had paid employees during 1958 for the census of manufactures, mineral industries, and business.

Detailed data collected in these censuses will be published for all industries and kinds of businesses by states, metropolitan areas, cities and counties, and by size of establishments. The bureau expects to publish preliminary figures on these censuses before the end of 1959. The last such report was conducted in 1955 to cover the year 1954.

ENGINEERED for high speed packaging, St. Regis open mouth bags for fertilizer include such time-savers as thumb notch, top creasing, offset gussets and spot pasting.

ADD LCPT* to your open

*Lower Cost Per Ton

Best way to protect your fertilizer profits starts with the bags you use and the way you pack them. In both areas, St. Regis may be your answer.

Whether you pack fifties, eighties or hundreds, St. Regis saves you money these important ways:

- St. Regis Sales Engineers can recommend basis weights and sizes of bags trimmed down to actual needs of your products—save on every unit you ship.
- St. Regis bag filling and closing equipment provides peak production to meet seasonal demands for greater outputs.
- St. Regis bag design specialists can provide you with bags that have more effective point of sale display built in to build sales.

Whether you want a whole new packing house, or just a single machine . . . or whether you simply need open mouth or pasted valve bags themselves . . . your

EQUIPMENT by St. Regis takes advantage of the savings made by St. Regis bags. Latest is the 185AS Bagging Scale, providing high production rates with fast grade changes and minimum maintenance.

SAVES by eliminating leakers, guaranteeing effective closures. St. Regis Thread Saver keeps pace with higher speed production.

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MONEY and time are saved for you by 8 conveniently-located St. Regis plants that make bags available when you want them.

N. P. F. I. News

IN THE WEST

Scientific Fertilizer Use

The second annual Arizona Fertilizer Conference was held on the University of Arizona campus, Jan. 21. The theme of the meeting was the importance of planned, scientific use of fertilizer to increase farm profits.

A progress report on new findings in soil fertility research in Arizona was presented by Dr. T. C. Tucker of the University's Department of Agricultural Chemistry and Soils. Other major speakers stressed the role of the agricultural extension specialist in putting research information to work, the importance of the grower understanding the principles of fertilizer economics, and improved methods of fertilizer usage.

The conference was sponsored by the University of Arizona in cooperation with the National Plant Food Institute.

Award To Colorado Student

Albert Plant recently was awarded a $200 prize for being named the outstanding senior in agronomy at Colorado State University, Fort Collins, Colo. The prize is awarded annually by the NPFI and was presented by Dr. Richard B. Bahme, Western Regional Director of the Institute.

Aerial Fertilization Recommended

Aerial application of nitrogenous fertilizer to obtain additional livestock use of lightly grazed rangeland was highly recommended by Dr. Dixie Smith, Wyoming University agronomist, at a recent Western Range Fertilization Conference held at Redding, Calif.

Dr. Smith said that significant increase in forage utilization on aerially fertilized areas has been shown from experimental studies conducted in the Big Horn Mountains of Wyoming in 1956 and 1957. The treated Big Horn areas were fertilized at the rate of 67.5 pounds of nitrogen per acre.

The use of aerially broadcast fertilizers by private ranch operators or on federally administered lands may well become as well established as the spraying of big sagebrush, Dr. Smith declared. On aerial fertilized plots, he continued, the increase in forage production amounted to almost 800 pounds per acre.

The Western Range Fertilization Conference was sponsored by the National Plant Food Institute and the California Fertilizer Association.

Roche D. Bush, range conservationist with the U. S. Department of Agriculture, also spoke at the meeting and said that the use of range fertilization and the lana vetch legume will extend the green feed period to nearly double the normal span in the spring. He added that three to five times the normal amount of feed also would be produced.

Presently, the major limitation of the annual range is the short green feed period, he said. Lana vetch is a newly-developed self-perpetuating annual legume that matures with resident annuals but retains much of its protein and can be used to furnish good late feed.

IN THE SOUTH

Agronomy Award To Weeks

William J. Weeks Jr. of Florence, S. C. (right) was the first recipient of the agronomy achievement award which will be made annually to the outstanding student in the field of agronomy at Clemson Agricultural College. The award is being presented by Dr. Samuel L. Tisdale, Southeastern Regional Director of the National Plant Food Institute. Sponsored by the Institute it includes a cash grant of $200.

Tennessee Fertilizer Program

A grant of $2,000 has been awarded to the Tennessee Agricultural Extension Service by the NPFI to support a series of fertilizer demonstrations during 1959 in one county in each of the five extension districts in the state.

The demonstrations will be carried out on fields of outstanding farmers in each area and will be identified by signs indicating the practices being demonstrated. The amounts and ratios of fertilizer to be used for each field will be determined after a chemical analysis of the soil has been made. Publicity will be given to the project through newspapers and radio.

Bankers Furnishing Soil Samplers

The Georgia Bankers Association, in cooperation with the NPFI, has made available eight soil sampling tubes to the county agent in each of the 25 counties included in an expanded Georgia Agronomy Program. The tubes will be used by farmers and are expected to expedite taking of the samples.

W. G. Cobb, chairman of the agricultural committee of the bankers' group, said that farmers who use lime and fertilizer in keeping with soil test recommendations are better loan risks and better customers. He suggested that each member banker visit the county agent's office to see that the soil sampling tubes have arrived.

Georgia Fertility Demonstrations

The NPFI has completed arrangements with the Georgia Agricultural Extension Service for support of a program to demonstrate the value of using recommended rates of mixed fertilizer and nitrogen on pastures and corn.

The project is under the supervision of Ralph Johnson, extension agronomist. The Institute is providing $2,000 to assist in this undertaking which will be carried out during the 1959 crop year. Approximately 26 fertility demonstrations are to be set up on pastures and corn.

(Continued on Page 119)

HOW TO GET THE MOST FOR YOUR FERTILIZER MACHINERY DOLLAR

Before You Buy, Check Sturtevant's Answers to These Key Questions

Q – How much experience is built into the design?

A – You get the benefit of 84 years of practical fertilizer industry experience in each Sturtevant machine you buy. Unrivaled for fertilizer plant engineering know-how, Sturtevant originated the 'Unit' idea. Whether your need is for a replacement pulverizer or mixer, or a completely modern granulating unit, Sturtevant-engineered machinery always can be depended upon to fit your requirements like a glove.

Q – Is the machinery engineered for peak-load efficiency?

A – All details in each Sturtevant machine have been proved by years of peak-load performance in fertilizer plants. Rugged construction that withstands the most slam-bang use, gears designed to always perform dependably, bearings that stand up under the heaviest loads, all can be taken for granted in Sturtevant machinery. Many Sturtevant machines have been operating at top capacity and efficiency for well over a quarter of a century.

Q – How accessible is the machinery for clean-outs and repairs?

A – Clean-outs are a constantly recurring problem in the operation of a fertilizer plant. And minor repairs on hard-to-get-at machinery can consume hours of costly man and production time. Sturtevant's practical "Open-Door" design guarantees quick accessibility — for clean-outs and repairs. Any parts requiring cleaning or maintenance are quickly exposed by "One Man in One Minute".

For rugged, reliable, efficient machinery you can depend upon for years — or for engineering assistance in planning or upgrading your fertilizer unit — it will pay you to consult Sturtevant. Write to STURTEVANT MILL COMPANY, 123 Clayton St., Boston 22, Mass.

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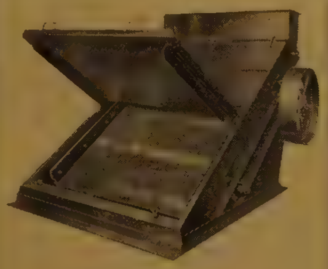
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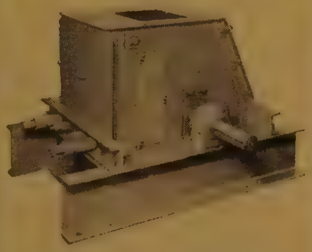
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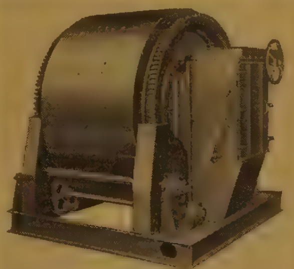
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simplifies packer's inventory –trims costs by $42,000

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The question, put by a Southern packer to Union Packaging Specialist Henry Scott, led to a complete analysis of the company's bagging operation. The analysis in turn produced three important recommendations. And $42,000 annual savings!

Working through Union's 5-Star Packaging Efficiency Plan, Scott reduced the size of one bag. The shorter Multiwall gives firmer packing and neater stacking. Further package engineering enabled the company to reduce its range of Multiwall bag styles and sizes by 30 per cent!

Union's Art Department also created a family of high-recognition designs for the firm's existing products. And finally, a brand new design which will help launch 400,000 tons of new product to be marketed this year.

Perhaps Union's 5-Star Plan can help unearth a money-saving idea for you. Perhaps several. Worth looking into, wouldn't you say?

Union Multiwall Recommendations are based on this 5-Star Packaging Efficiency Plan

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UNION'S PACKAGE ENGINEERING DEPARTMENT will study your Multiwall bagging methods and equipment and make appropriate recommendations, regardless of the brand of Multiwalls you are now using.

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VEGETABLE INSECTS

(From Page 26)

the end of eight seasons. Lindane provided commercial control for only one year.

"Near perfect" to excellent control has been provided by the following materials (all applied at 10 pounds per acre): Aldrin and Dieldrin, both 10 years; Heptachlor, 8 years; Endrin and Isodrin, 6 years. Chlordane for 10 years has given excellent wireworm control, but tuber flea beetle damage started to build up rapidly in the 9th and 10th years.

Lighter dosages of some of the chemicals have provided good results over shorter periods, although there is an indication some lose their effectiveness through the years as dosages decrease. However, Dieldrin at 2 pounds per acre is still giving near perfect control of both pests at the end of the sixth season.★★

FRUIT VIRUS

(From Page 26)

which provides the necessary resistance. Dr. Peay has reported that neither Thimet alone nor the extract gave healthy sugar beets resistance to the disease when leafhoppers from infected plants fed on them.

Scientists speculated on the possibility of a synergistic action between Thimet and the juice from the ailing plants. Next step will be for biochemists to separate the fractions of the juice to discover if there is something resembling an antigen. Then will come discovery of its chemical composition, followed by building the material synthetically.

Almost unlimited possibilities exist in checking virus ailments in plants if this discovery by Dr. Peay can be duplicated in controlling diseases in other plants, it was pointed out. The news tended to offset whatever discouragement might have been felt at the realization that entomologists are facing a more widespread problem of insect resistance to some of the most popular, or more promising, chemicals.

Also, some weaknesses have appeared as a result of another year's experience with pesticides that apparently were almost flawless. For example, Sevin — although it is holding up well and still ranks as one of the "stand out" insecticides —is like DDT in apparently promoting mite infestations, Dr. Telford remarked. In fact, it may even have this characteristic more strongly than does DDT. As a consequence, an acaracide must be used with it.

In addition, it is highly toxic to bees. Dieldrin comes in this latter classification, ranking ahead of Sevin . When used on pear trees against psylla, the residual action of Dieldrin is harmful to bees, Dr. Telford commented. Furthermore, although Dieldrin has been used in Washington state against psylla for only two or three years, the pests apparently already are developing a resistance to it.

Tests have been made in the laboratory under very critical conditions, and have confirmed this suspicion, Dr. Telford added. Resistance in the Yakima and Wenatchee areas appears much greater than in other parts of the state.★★

CHEMICAL INDUSTRY

(From Page 26)

on the First National bank's requirements for farm loans.

"Per Cent of Profit on Investment" was the topic of the speech by Fred Shanaman, Tacoma, Wash., president, Pennsalt Chemical Corp. C. L. Turzan, sales manager for the western district for Geigy Agricultural Chemicals, told of the importance of product knowledge.

Charles H. Starker, Owatonna, Minn., sales promotion director and entomologist with Gandy Company, told of the longer residual life obtained from application of granular chemicals instead of the dust or liquid forms.★★

Legislation affecting the agricultural chemicals industry was outlined by Frank B. Stewart, co-chairman of the Western Agricultural Chemicals Association legislative committee, while Roy Miller, Portland, president of Miller Products company, reported on work which had been done by the agricultural chemicals coordinating committee.

John T. Coke, Portland, technical representative of Naugatuck Chemical division of U. S. Rubber Company, was elected chairman of the NWACI conference for 1959, succeeding George Kitzmiller, also of Portland, chemical division, Pacific Supply Cooperative.★★

AC

Central Farmers Fertilizer Co. has announced that its phosphate plant in Georgetown Canyon, Idaho, is 75 per cent complete. Production of high analysis superphosphate is expected to start by April 1.

AC

Raymond H. Walcott, technical administrator, Agricultural Chemicals Division, Stauffer Chemical Co., New York, retired at the end of December. He had been with the company since 1924.

AERIAL APPLICATORS

(From Page 59)

tors wipe their hands on their thighs) third, the top of the head and fourth, face and eyes.

Safety posters point out these danger areas and instruct operators on how to protect against them by using helmets, respirators, goggles, gloves and clean clothing every day. He stressed the use of plenty of water for cleaning both the operator and the equipment. These safety precautions, he reminded, apply even more to ground applicators than to aerial applicators, because, in most cases ground operators are mixing and loading the material themselves and drive through the toxic clouds on their rigs.

Conclusion of this report on the meeting of California Aircraft Association will appear in our March issue.

TWO WAYS to MORE PROFITS
through Phillips Technical Service:

1 with Phillips 66 Electronic Computer Service

These men are saving Phillips mixer customers thousands of dollars. By employing the "brains" of the electronic computer formulating machine, they help fertilizer mixers arrive at more effective and lower cost formulations.

This extra individual service costs you nothing. All you do is furnish your Phillips *66* fertilizer field man the analysis of your materials, their cost, and the grades you wish to produce. Phillips technical service section applies these facts to production standards on heat, moisture, ammonia-holding capacity, nutrient value and weight. This information is then fed into the electronic computer which figures the most economical and effective formulation in a matter of seconds.

Call your nearest Phillips *66* office (listed below), for complete information on the ways Electronic Computer Service can help you save time and money.

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Free services are available to you . . . from our new Phillips *66* Pilot Plant, to help you cut formulation costs and improve the quality of your products.

Continuous pilot plant studies are made on new and more economical formulations that save you money on your ingredients. Research and specific processing problems are translated into terms of commercial production . . . helping you eliminate the necessity of "hit or miss" experiments that consume costly manhours and materials.

The profit team . . . the new Phillips *66* Pilot Plant and Phillips *66* Electronic Computer Service . . . provides progressive, practical know-how that lets you cut manufacturing costs while turning out better quality products. These fine new services, plus high quality Phillips materials and fast, dependable deliveries will make it more than worth your while to deal with Phillips. Give us a call.

- **For your high quality fertilizers, look to Phillips for a dependable source of supply . . .**

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WICHITA, KAN.—*501 KFH Building*

Utah Weed Conference

The Utah State Weed Conference will be held Feb. 26 and 27 at the Utah State Fairgrounds in Salt Lake City, Utah.

OHIO-INDIANA CONF.

(*From Page* 63)

inaugurated six years ago and is held annually either at Ohio State University or Purdue.

This year's meeting was preceded by a Mid-West Agricultural Pesticide Conference at Purdue, Jan. 20 and 21. Dr. J. V. Osmun, head of the Purdue Entomology Department, spoke at the meeting and said that the annual cost to farmers from losses due to insects, diseases, and weeds is $10,000,000,000. He likened chemical treatments to crop insurance.

Dr. Osmun said that there is increasing need for information on pest recognition, factors influencing pest increases, timing of treatments, and predicting pest abundance, that is attainable only through annual meetings where the year's developments can be reviewed by experts and where farmers and others can report experiences and exchange ideas.

Among the discussion topics at the meeting were insect problems and farm crops. Early season corn, legumes, livestock and stored grain were discussed by Dave Matthew, R. T. Everly, G. E. Gould, M. C. Wilson, and R. C. Dobson of the Purdue Entomology Department and Earl Wade of the U. of Wisconsin. Weeds were discussed by O. C. Lee, D. J. Moore, R. J. Rogers, and G. F. Warren of Purdue and F. W. Slife, U. of Illinois. Bob Warren of Valparaiso, Ind., contributed information on applicator equipment.★★

CALL AIR PLANE

(*From Page* 66)

and spray patterns than high wing craft.

The landing gear is sturdy and has a spread of eight feet, making it stable on the ground. The plane's large tires and especially designed landing gear are good for long, trouble-free service. Another feature of importance to agricultural operators is the protective coating on the primary structure of the aircraft. CallAir uses an epoxy resin base catalyst protective coating that is chemically resistant to agricultural chemicals.

For dispersing chemicals, the plane is equipped with a Bartlebaugh Quick-Change Combination Unit. The unit is installed on the 110 gallon hopper tank and enables the operator to shift from dust to spray by merely moving a lever and opening or closing the screen valve on the bottom of the airplane. The spreader may be taken off when spraying. The spray pump is a simplex air-driven pump mounted to the side of the dust venturi in such a manner that it will not disturb the air flow in the venturi. The pump is equip-

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"TAKO" Airfloated Colloidal Kaolinitic Kaolin is practically a chemically pure inert colloid with exceptional qualities and excels as a diluent-carrier in formulations of insecticides-pesticides. It gives increased workability—dispersion in formulations, its purity is highly desirable due to its compatibility with chemicals, its colloid properties give increased toxic action—greater adhesive-adsorptive properties.

"TAKO" This *Natural* Very Pure *Colloidal* Kaolinitic Kaolin is produced from our Company-owned mines, processed under straight-line production with the very latest electric controlled automatic equipment—resulting in our very low per ton established price for this quality *Colloidal* product.

Non-Abrasive—Non Hygroscopic—Non Caking—Free Flowing

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INVESTIGATE "TAKO" FOR YOUR REQUIREMENTS

Interview with an Executive

Mr. Charles Furst
President of
Furst-McNess
Company
Freeport, Illinois

(Freeport is located in Stephenson County, the leading dairy county in the State of Illinois. Mr. Furst is well acquainted with dairy problems and requirements.)

Question: Will the McNess Cattle Spray contain TABATREX again this year?
Answer: IT CERTAINLY WILL!

Q. Mr. Furst, what is that can on your desk?

A. This is our McNess Dairy King Super Stock Spray which we introduced last summer.

Q. Introduced? Is this the first cattle spray you have ever sold?

A. No, indeed. However, this one is different from our previous products because it contains TABATREX insect repellent.

Q. How did sales of this new product with TABATREX compare with sales of previous products?

A. They were significantly greater. In fact, our sales of the new cattle spray were greater than in any year since 1946.

Q. To what do you attribute these increased sales?

A. First, to the fact that we had a superior product. We know that this is so because many of our customers have reported increased milk production after using the McNess Spray on their herds.

Q. Was there anything else?

A. Yes, there was. The advertising and educational campaign put into effect by the Glenn Chemical Company last spring and summer was highly effective. Consumer interest was intensified, and consumer demand was heavy. Frankly, we're quite enthusiastic about our results in 1958.

Q. And what about 1959? Will the McNess Cattle Spray contain TABATREX again this year?

A. *It certainly will.*

Your Cattle Spray should contain TABATREX too. Register your label now.

For approved labeling and complete information, write or phone:

GLENN CHEMICAL COMPANY, INC.

2735 North Ashland Avenue
Chicago 14, Illinois
Phone: EAstgate 7-9350

Manufacturers of Tabatrex INSECT REPELLENT ped with a brake to make it inoperative when the airplane is used as a duster. The hopper gate is used as an emergency dump valve while spraying. It enables the pilot to jettison his load of spray liquid in three seconds or, if he so chooses, he may dump only part of the load and close the gate to avoid wasting all of his chemical. The entire combination unit is constructed of aluminum. The plumbing is copper tubing with the exception of the booms which are 4130 chromoly steel.

The wing tips are squared and large fiberglass spillplates give added stability and prevent stalls at the tips, even at extremely low speeds.

The pilot seat is made of fiberglass and is a bucket type with canvas covered cushions stuffed with animal hair and foam rubber. The nose cowl also is fiberglass. It is said to be free from the possibilities of vibration cracks and is built to withstand the normal punishment that nose cowls usually get. The hopper tank, also, is fiberglass. The door at the top of the hopper is large enough to make dust or seed loading easy. The door has a coreseal gasket to insure a tight closure.

A canopy enclosure over the pilot and passenger seat is an optional item. The company's A-5 model can be purchased either with or without starter, generator, battery, and lights. The A-6, however, must have an electrical system. The A-6 is recommended by the company as a combination plane. It has 30 additional horsepower which help compensate for the additional drag which the combination unit has over a straight duster or a straight sprayer.

Both types of aircraft are covered with fabric and fifteen coats of acetate cellulose butyrate dope. The standard color is yellow with a red trim.

The CallAir 150 A-5 carries a useful load of 1,130 pounds and has a gross weight of 2,150 pounds. The 180 A-6 carries a load of 1,180 pounds.★★

NE WEED CONF.

(*From Page* 50)

formation on herbicide formulation and application of direct interest to the weed control applicator was presented by J. W. Van Valkenburg and J. A. Kelly under the title "The Emulsification of Herbicides." For any herbicide-oil program, they suggest, the oil and herbicide should be mixed first, then this mixture added to the water.

Discussing factors that affect control, they emphasized that the largest possible spray deposit is wanted on the foliage for a given volume of spray. In this connection, it has been demonstrated that maximum oil deposit is obtained with merely a mechanical mixture of oil and water. The authors warn that as more wetting agent is added, deposit can actually decrease. "Accordingly, many herbicide formulations are designed to

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GOES WITH ALL TOXICANTS . . .

You need little or no stabilizer when formulating dusts with the newer pesticides when you use PYRAX ABB as the diluent.

The unusual combination of chemical inertness, neutral pH, dry flowability and low moisture content has made PYRAX ABB the logical choice for formulating the commonly used toxicants.

When you dilute any toxicant with PYRAX ABB, you reduce costs due to easier handling, better coverage, and simpler formulation.

The excellent compatibility of PYRAX ABB has made it the most widely used Pyrophyllite in the agricultural field.

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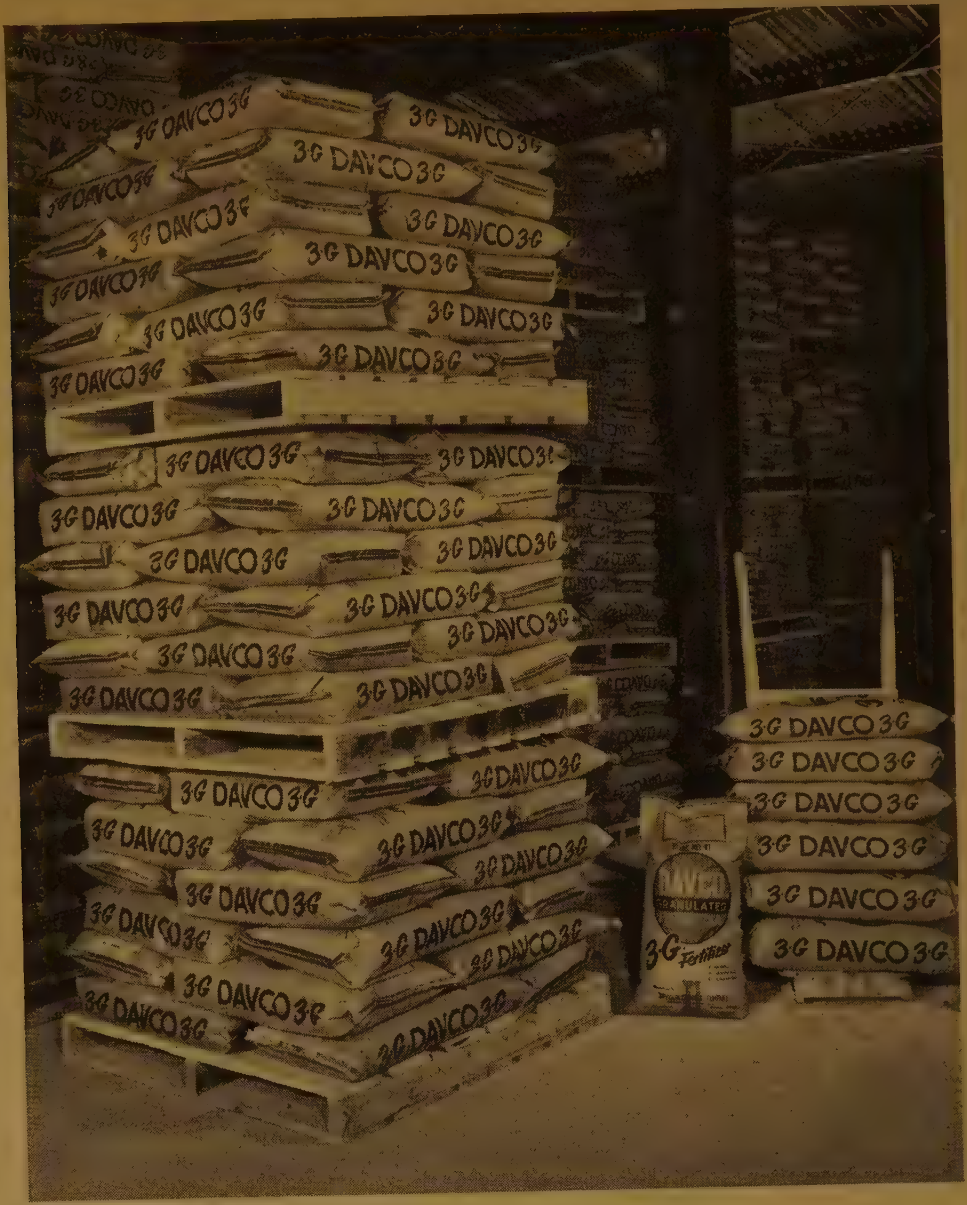
NOTICE ANYTHING DIFFERENT ABOUT THESE MULTIWALLS ?



Bemis SINGLE GUSSET Multiwalls are being used by the Davison Chemical Company, Division of W. R. Grace & Company, Baltimore, Maryland. The single gusset bags have good stacking qualities. They palletize well, and the filled pallets are stacked three high. In addition, these *new* Bemis multiwalls give improved performance on the packer.

Yes, they are different.

For one thing, they are Bemis SINGLE GUSSET Sewn Valve Multiwalls . . . another Bemis *first.* (They stack so uniformly, you have to look closely to notice the single gusset construction.)

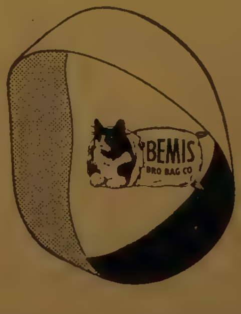
But the BIG differences are the ones you will see in the packing performance where you get uniform filling, steadier production and greater economy. Bemis SINGLE GUSSET Multiwalls provide these important time- and labor-saving benefits:

1. The flat tube side, opposite the valve, provides more room for the product flow during filling.

2. The additional space in the corner helps prevent blowout.

3. Fertilizer does not back up and clog the filler spout.

And still another important point—the additional usable space created by the flat tube corner often permits the use of a shorter bag, *which would save you money.*



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give only adequate emulsification of the oil solution in water. The emulsions are relatively fast breaking so that when a spray hits foliage, maximum deposit may be obtained and consequently better brush control may result."

Discussing how much agitation is required for correct emulsification of herbicides, applicators are warned that while excellent emulsions can be obtained with either paddle or by-pass agitation, greater precautions must be observed in making up emulsions using by-pass agitation alone. Sufficient time must be allowed for the complete solution to pass through the by-pass system six times.

To minimize spray drift, the authors recommend invert (water-in-oil) emulsions rather than the usual oil-in-water emulsions. By employing special emulsifiers, and varying the order of addition of the various ingredients, it is possible to produce thick invert emulsions of almost a mayonnaise type consistency. Using appropriate nozzles, these thick emulsions can be sprayed, with the high viscosity resulting in large spray droplets which are relatively unaffected by wind. Other plus factors of these invert emulsions are that much larger deposits can be built up on foliage and good deposits can be obtained in spite of wet foliage.

The speakers also referred to an interesting new additive to herbicide emulsions, "Forron," developed by Dow Chemical Co. which produces the effect of employing an oil-herbicide combination without actual use of oil. "Forron" contains an extender which causes the herbicide to penetrate foliage and translocate into the stem better, thus improving effectiveness in brush control.

Committee Chairmen for the 1959 meeting were: Program, P. W. Santelmann, Univ. of Maryland; Co-ordinating, M. M. Schreiber, Cornell Univ.; Publications, D. A. Schallock, Rutgers University; Sustaining Membership, L. Southwick, Dow Chemical Co.; Public Relations, E. R. Marshall, Carbide & Carbon Chemical Co.; and Awards, C. L. Hovey, Eastern States Farmers' Exchange.

The outstanding paper award was presented by C. L. Hovey, Eastern States Farmers' Exchange to: W. E. Wells and R. A. Peters, both of the University of Connecticut, co-authors of the paper, "Yields of Legume-Forage Grass Mixture as Affected by Several Herbicides, Applied Alone and in Combinations During Establishment." John R. Havis, University of Massachusetts, accepted an award for the outstanding paper, "Influence of Soil Moisture on the Activity of EPTC, CDEC and CIPC," prepared by himself, R. L. Ticknor, and P. F. Bobula.

An award of merit was presented to Paul A. Lutz, county agent, Schenectady County, N. Y., for planning, organizing and promoting better weed control practices as an integrap part of the extension program in New York State.★★

. . . in any size from 325 mesh up to ½″

A uniformly produced carrier compatible with both organic phosphates and hydrocarbons

It's Pikes Peak Clay . . . the carrier that is recommended for malathion, methyl parathion, ethyl parathion *and* hydrocarbons . . . compatibility approved by toxicant manufacturers because of exceptionally low moisture content and remarkable pH of 5. In addition, it is highly absorbent, less hygroscopic and has unmatched flowability.

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Whether you are looking for a carrier for concentrates . . . or for adjusting bulk density . . . or fluffing field strength dusts . . . and you want it in granules or ground to 95% through a 325 mesh . . . you will find that Pikes Peak Clay always seems to be "just a little bit better." For proof, write today for samples of Pikes Peak Clay. Or, better still, call GRaceland 7-3071 in Chicago.

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What price weed control?

For 25 cents you can buy enough Oldbury sodium chlorate to treat about 100 square feet of weed-infested land.

That's a bargain. There's no other way to stamp out weed and grass infestation so cheaply and lastingly.

You need no expensive equipment. There are no costly ingredients to add. Oldbury sodium chlorate goes on dry—or dissolves easily in water.

One treatment does the job, as a rule; quickly kills perennial weed and grass top growth; destroys germinating seeds as well as growing roots. The sterilant effect lasts one to two years in heavy soils; up to a year in sandy soils.

Low cost is today's No. 1 reason why Oldbury sodium chlorate is your best choice for spot control in crops, and for general control on ditch banks, canals, headlands, along fence rows and roadsides.

Full-time Hooker agronomists can help you plan weed control programs and can advise you on handling, storage, and application of sodium chlorate. You get fast delivery direct from the nation's leading producer with plants at Niagara Falls, N. Y., and Columbus, Miss. Oldbury sodium chlorate, 99% pure, is shipped in steel drums, 100 and 450 lbs. net.

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N P.F.I. NEWS

(From Page 108)

S. C. Soybean Contest

The top yield in a Lee County, S. C., five-acre soybean contest that was held this past season was made by Edward McDowell who produced 62.1 bushels per acre on five acres.

The soybean contest was sponsored by the People's Bank of Bishopville, S. C.

Fertilizer Salesmen's Training School

A fertilizer salesmen's training school, designed to improve sales techniques through the use of the latest scientific and economic information affecting farmers, is being sponsored by the NPFI in Columbus, Ohio, on February 4. Sales representatives of members as well as non-members of the Institute with operations in Ohio have been invited to attend.

FOREST MANAGEMENT

(From Page 61)

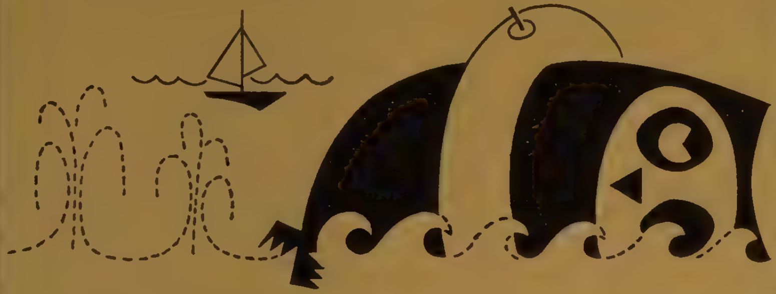
gallonage atomizing nozzle that will provide suitable atomization without delivering too much spray material. Nozzles such as 2.5 to six g.p.h. cone type, oil burner nozzles are very effective. The round tank, two to three gallon, compressed air back sprayers costing about $8 are most economical.

The mist blower, for applying herbicides and silvicides, is the most fantastic plant killer known. For most brush and forest management operations, mist blowers in the five to 12 h.p. sizes are most applicable. These units are mounted on a four-wheel drive power wagon, jeep, regular tractor, or crawler type tractor with bulldozer blade mounted in front. The abundance of stumps, trees, rocks, and ditches determine the kind of carriage vehicle. On tractors, the mist sprayer is mounted on a sturdy rack at the rear of the tractor so that the air outlet points at right angles to the line of travel. The outlet should point slightly above the top of the growth to be treated. The shut-off valve should be close enough to the driver for him to turn it on and off easily. For most work, it is advisable to use 12 to 20 pounds pressure and a No. 1 or No. 2, 1/8 inch Whirljet nozzle. About 30 to 40 acres per day can be treated, on favorable terrain.

Where drift hazards can be avoided, the two h.p. knapsack mist blower can be a useful tool for spraying brush up to 30 feet in height, using two to four gallons of finished spray concentrate per acre of solid growth. Less material is needed for spot treatments. A drop size range of 50 to 75 microns mass average diameter is best for most purposes. A good knapsack mist blower can treat 10 to 15 acres of brush per day.

Helicopters are being used successfully to treat many miles of rights-of-way along power lines,

Barden Clay Quiz



DO YOUR WETTABLE POWDERS HAVE MAXIMUM SUSPENSION?

Everyone knows Barden's outstanding superiority in suspension: it's a "must" in preparing wettable powders. Barden is the industry's kaolin standard for a carrier-diluent in wettables and dusts; for an anti-caking conditioner in prilled fertilizers, and 93-94 percent sulfur.

These Barden features make it superior for all formulations: lowest abrasion...better sticking...high bulking value...greater uniformity...better deposits ...maximum economy...superior wettables.

Working samples on request.

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Wise owls read Huber Technical Data. Ask to be put on our mailing list.

FOR DUST OR SPRAY
USE BARDEN CLAY
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Interested in 75% Wettables and Concentrates? Zeolex 7A is the new synthesized carrier for top results. It's versatile, too: serves as a bulking agent, and as a static-free conditioner for 99 percent sulfur grinding. Write for more information.

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production costs with a

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air swept grinding system

The KENNEDY Air Swept Tube Mill Grinding System is the ultimate in high production and low operating cost. The experience of the many owners of KENNEDY Mills has shown that the cost of this mill can be paid in a few years with the savings in maintenance and power alone!

KENNEDY 10′ x 15′ Integral Gear Drive Air Swept Ball Tube Mill and #93 Exhauster Fan in service at the American Agricultural Chemical Co., Pierce, Florida.

HERE ARE A FEW OF THE REASONS FOR THE ECONOMY AND POPULARITY OF KENNEDY PULVERIZING SYSTEMS . . .

REDUCED MAINTENANCE • Tramp iron and other foreign material cannot damage the system. Years of operation are assured before parts (except for grinding balls) require replacement.

CONTINUITY OF OPERATION • Lubrication and replacement of grinding media is accomplished without shutdown or interruption of production.

MINIMUM POWER • Careful design and construction and a proven pressure lubrication system insure a high mechanical efficiency.

HIGHER PRODUCTION • Single grinding units are built for capacities to 100 tons per hour. Production and fineness remain constant, month after month.

LOWER OPERATING COSTS • Dependability of equipment and reliable automatic feed control assure high production with minimum manpower.

CAPITAL SAVINGS • No magnetic separators are required. KENNEDY units require less structural steel and floor space per ton of product.

FLEXIBILITY OF DESIGN • KVS Air Swept Grinding Systems are available for a wide range of capacities and products.

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using three to six quarts of 2,4,5-T or 2,4,5-T propionic acid in three to five gallons of No. two fuel oil per acre. Helicopters fly parallel to the power line and throw a coarse spray of about 200 microns drop diameter in from the edge of the right-of-way towards its center. Airplanes may be used in much the same way as helicopters, except that larger areas are required and the drift hazard is far greater.

NEW PESTICIDES

(*From Page* 41)

principally for application from late fall to early spring. The new product, Atrazine 50W, is effective from late spring through early summer, thus giving a complete year-round program for industrial weed control.

Although there is some herbicidal activity through foliage contact, Atrazine 50W acts mainly through the roots. Therefore, it is dependent upon adequate rainfall to carry it into the root zone.

Atrazine 50W is low in toxicity to man and animals and does not require the use of special protective clothing. It is nonflammable, low in electrical conductivity, noncorrosive and easily flushed from sprayer equipment with water.

Although at this time label claims for Atrazine 50W extend only to use on non-cropped land, extensive tests have also shown promise for weed control on certain agricultural crops such as corn, although the product is not yet recommended for such uses.

Nemagon® Soil Fumigant

ALTHOUGH Nemagon soil fumigant is now a well established nematocide, new methods of application developed during the 1958 season warrant its inclusion in this series. A particular advantage is that Nemagon is not phytotoxic to most crops. This, together with the diversity it offers in formulations, has opened new, easier and more economical applications in nematode control.

Combinations with liquid and dry fertilizers have proven as effective as when the two materials were applied separately. And because of the non-phytotoxic properties, many farmers combine planting, fertilizing and fumigating in one operation, without the need for special application equipment.

A recent important development in facilitating nematode control was the discovery that Nemagon can be applied in irrigation water. It is anticipated that this method will become the preferred nematode control practice in much of the irrigated land in the Southwest.

"Dowicide A" Fungicide

DOWICIDE A (Sodium orthophenylphenate) has agricultural uses as a fungicide. It is used to protect all citrus fruit and apples, pears, pineapples, peaches and cantaloupes against mold and bacteria.

Water solutions of Dowicide A in the range of concentration from 0.3 per cent to 1.0 per cent by weight are used to disinfect

strongest and most efficient spreader body ever built!

BAUGHMAN'S K-5

LIME and FERTILIZER SPREADER

Baughman engineering insures you:

LOWER MAINTENANCE COST... thanks to rugged construction, fewer parts and reliable Baughman quality throughout.

BETTER SPREADING... because you can accurately regulate the number of pounds spread per acre and be sure of uniform distribution.

LONGER BODY LIFE... a stronger body with extended side jacks, plus internal braces and reinforced top edge for full side support and greater protection.

GREATER VERSATILITY... the chance to select the drive, conveyor and distributor that best answers your spreading needs.

Your choice of...
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WONDERWALL(TM)

REDUCES BAG BREAKAGE 80%!

WONDERWALL is West Virginia's new multiwall bag. It's tougher because it's made from Clupak* kraft paper that stretches.

Mr. W. T. Wyman, Purchasing Director of the Peerless Cement Co., a Division of American Cement Corp., at Detroit, says:

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buildings against bovine, poultry and swine tuberculosis, contagious abortion, fowl typhoid, white diarrhea, and Newcastle disease. It can also be used as a disinfectant for egg storage rooms, poultry feeding stations, hatcheries and broiler plants. Sheep "ticks" can be effectively controlled by water-soluble formulations containing Dowicide A. It also is used in the wax emulsion coating for citrus fruit to control blue mold and stem end rot. It is being used as a dip to disinfect fruit and berry boxes and vegetable crates for transfer and storage and to disinfect litter used as bedding for animals.

It is sold in commerical quantities and can be obtained through normal outlets. The product is sold in products formulated by various manufacturers and is applied in formulation.

Residue tolerances range from five to 125 parts per million, depending upon the fruit involved in the treatment.

WASHINGTON REPORT

(*From Page* 68)

change in the present trend toward fewer and larger farm operations, with continuing efforts to improve farm production efficiency. In the long run, this trend will mean more agricultural chemicals sales.

This trend might be vastly speeded, however, if new farm legislation puts a premium on farm production efficiency. On the other hand, the trend could be slowed if farm legislation pays subsidies to farmers who want to continue farming as their grandfathers did.

In either case, both Congress and the President have run up warning flags that the present farm programs cannot continue. The USDA is now paying out about $7 billion a year for farm programs, much of it to control production and get rid of surpluses. Meanwhile, Government investments in surplus commodities are continuing to zoom. They'll reach $9 billion by July 1. With another bumper harvest in sight for 1959, total government investment in surplus farm commodities is expected to hit $10 billion by 1960.

Chances are that something will be done to curb this trend. Present feeling in Congress is to let farmers produce as efficiently as they can and sell at free market prices, then pay subsidies to those who cannot stay in business under these conditions. The main motivation for this compromise is the politically-smart slogan of preserving "family-type" agriculture.

It's much too early to tell which way new legislation may go, but the key to whatever farm legislation is developed during the year may well be this slogan of preserving "family-type" agriculture. Some farm-wise politicians privately believe that if more so-called "family-type" farmers used more fertilizers and pesticides to produce more efficiently, they wouldn't have to look to Washington to keep them on the farm.

* * * *

The Federal Food and Drug Administration is quietly moving in on quacks who have been making false and misleading claims for natural, organic food supplements. In one recent case, house-to-house canvassers were recommending their pills for every health and disease condition from cancer to insomnia and fear complex.

The pill's contents included such materials as alfalfa, water cress, parsley, wheat germ, mint leaves, beets, buckwheat, yeast, prunes, rose hips, rice polishings, cyster and egg shells, clay, unsaturated fatty acids and amino acids in combination with vitamins and minerals.

FDA seized the product and trial was terminated when the manufacturer elected not to contest FDA's allegations. FDA Commissioner George Larrick reports that the court decree clears the way for future action to stop unwarranted claims for such products made in the literature or by sales agents.

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The extent of spraying to control forest pests this year has not yet been determined, according to the U. S. Forest Service.

Large-scale spraying to control the spruce budworm in the Pacific Northwest over the past ten years has been so successful that further spraying will not be needed in 1959. Some 800,000 acres were sprayed there last year, and insect damage to timberlands in the area is way down. Parasites and natural predators appear to be taking over the job of controlling insect populations.

This does not mean that overall spraying to control forest insects will be less in 1959 than in 1958. Forests in Eastern Montana, Southern Idaho, and several National Forests probably will be in need of spraying this year. A preliminary estimate is that about 1,200,000 acres of forest land will be sprayed in 1959. This was the total of forest lands sprayed for pest control in 1958.

* * * *

Reports on the continuing boom in U. S. population are being watched closely by manufacturers and distributors of garden chemicals and fertilizers. Population now stands at 175,500,000 and is expected to hit 194,500,000 by 1965.

This represents a 10 percent increase in the number of mouths to feed—a healthy signal for growing use of both pesticides and fertilizers in agriculture. It also means a continuing boom in the formation of households and expansions of suburbs with suburban lawns and gardens. Private residential construction is now riding at a level of about $18 billion a year.

The catch is that despite the great increase in private residences, no one knows for sure how much home owners really spend on fertilizers and pesticides. Some dealers who serve suburban markets figure people with houses in the $12,000 to $20,000 bracket can be expected to spend from $50 to $200 a year on lawns and gardens. This should make garden sales a billion-dollar market, with a substantial portion going for fertilizers and pesticides.

But is it? Several companies are now quietly surveying the market to determine how good it really is. On this basis they can decide whether it is worth a major promotional effort.

* * * *

Louis Wilson, Director of Information, National Plant Food Institute, is continuing to receive new requests for his farm radio recordings, released periodically. The new requests put NPFI's farm radio service on more than 1200 radio stations, giving NPFI the largest agricultural radio network in the nation. NPFI's largest release features are:

"Test Your Soil To Build Your Profits" by Orville F. Walker, President, National Association of County Agricultural Agents.

"The Future of the Extension Service" by Dr. Henry L. Ahlgren, Director, Extension Service, University of Wisconsin.

"Conservation with Plant Food" by Luther Hardin, President, Vocational Agricultural Teachers' Association, Inc.

PEST ROUND UP

(From Page 65)

years. Breeding plots at Stuttgart were treated for the pest in late November. Oats in the east and northeast were generally infested with small populations, but one Poinsett County field averaged 75 chinch bugs per linear foot.

In a survey of 17 northwestern Oklahoma counties, scattered infestations of the greenbug were found in 13 counties, with the highest average being 27 per linear foot and 3-7 being the general range over most of the area. Three counties did not show any counts. Infestations were found in most of the panhandle section of Texas, with one area of Carson County averaging 10 greenbugs per linear foot. Counts in New Mexico averaged 0.5-1.5 per linear foot in 50

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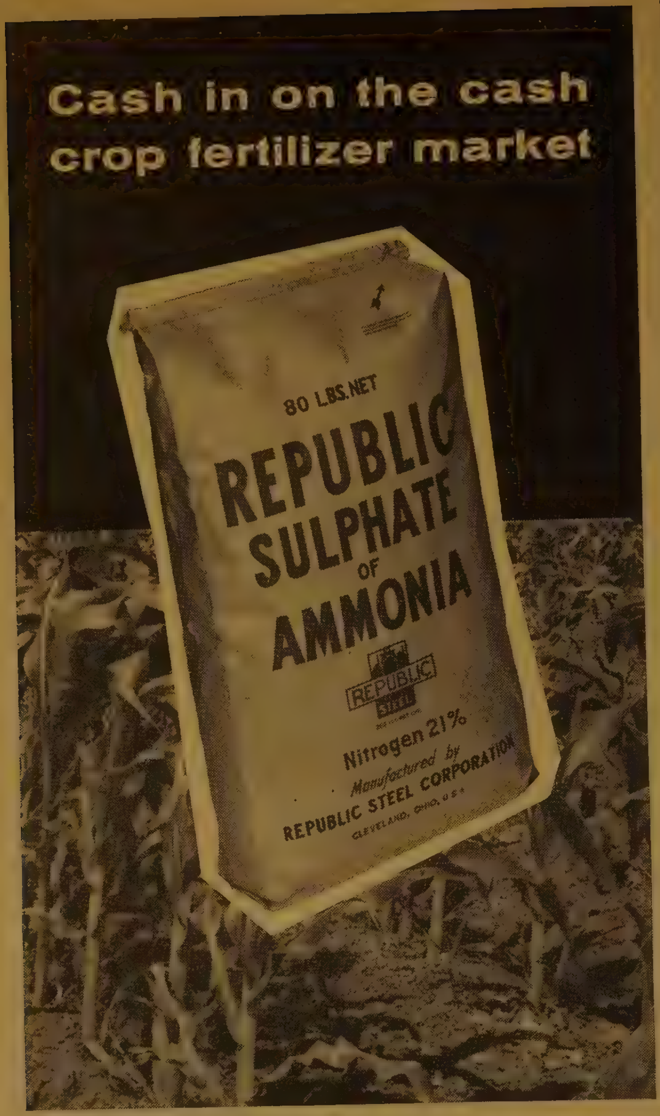
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percent of the wheat fields examined in Quay, Curry and Roosevelt Counties. Spotted alfalfa aphid continued active in several states during December. Populations ranging from 205 to 1,826 per 5 plants were found in the north central Kansas area, and from 427 to 652 per 5 plants in Riley and Pottawatomie Counties of the northeastern area.★★

EDITORIAL

(From Page 23)

It is too much to expect, perhaps, that the average farmer or home gardener will ever catch up with pesticide developments of the past ten years. What worries us is that the custom spray operator, the pesticide dealer and even the formulator are going to have a hard time getting "current,"—for so little is being done to get the story on these new pesticides across to them.

When they don't even know the names of the new products being introduced, when the experiment stations and the county agents find the new materials coming too fast to evaluate, and too meagerly promoted to keep track of, it begins to look to us as if it is time to call a halt. Time to start putting less emphasis on new research, perhaps, and starting to figure out what practical use to make of the many excellent products that have already been developed.★★

EXPERIMENTAL PLANT

(From Page 39)

variable speed motor and drive units which power the mixer and the rotary tubes are for the purpose of allowing increased operating flexibility.

Auxiliary components such as a rotary granulator, slurry tanks and reaction vessels can be easily added to the unit for converting it to performing functions of such processes as the TVA granulation process, the Dorr triple superphosphate and ammonium phosphate processes, nitric-phosphate processes, and others. A two man operating crew is adequate for most of the test operations.★★

BAYER 21/199

(From Page 53)

different locations. The two concentrations were about equally effective, satisfactory control being obtained for less than 2 and more than 6 weeks. The average duration of effectiveness for all locations was approximately 3 weeks. The single herd sprayed with 0.75-per cent Bayer 21/199 remained practically free of horn flies for approximately 8 weeks.

Satisfactory control of horn flies was obtained with 0.5-per cent methoxychlor for 2 to 3 weeks on two of the herds, and for 6 weeks on the third herd.

Moderate to heavy rainfall a few days after the spraying did not appear to be the primary cause of the erratic results. There was approximately 1 inch of precipitation within 36 hours following the spray date of herd No. 1. Herd No. 6 was exposed to 3 inches within 2 days after the first application. Herds No. 5 and 7 were exposed to 1 and 3 inches 4 and 2 days, respectively, after the second applications. These four treatments of 0.25-per cent were effective for 2 to 4 weesk.

These tests indicate that 0.25- and 0.5-per cent sprays of Bayer 21/199 are comparable with 0.25-per cent sprays of methoxychlor for horn fly control on cattle. ★★

References

Brundrett, H. M., W. S. McGregor, and R. C. Bushland. 1957. Systemic cattle grub control with Bayer 21/199 sprays. *Agr. Chem.* 12(6): 36-37, 123, 125.

Brundett, H. M., James A. Deer, and Owen H. Graham. 1958. The control of horn flies in the Rio Grande Valley of Texas with Bayer 21/199. *Jour. Econ. Ent.* (In press.)

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[1] Accepted for publication February, 1959. Published with the approval of the Director as paper No. 901, Journal Series, Nebraska Agricultural Experiment Station.

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NEW PESTICIDES

(From Page 41)

Co-Ral — Chemagro Corp., New York. A new insecticide spray-chemical for control of cattle grubs and other cattle insects. Known during experimental stage as Bayer 21/199.

Cyprex— American Cyanamid Co., New York. Fungicide suggested particularly for apple scab. Early experimental number, EF 5223. Chemical name: dodecyl guanidine acetate. Available commercially in 1959.

DEF—Chemagro Corporation, New York. Defoliant developed by Ethyl Corporation and Pittsburgh Coke and Chemical Co. Chemically, S,S,S-tributyl phosphoro trithioate. First marketed in 1957.

Delnav—Hercules Powder Co., Wilmington, Del. A relatively new miticide, which has label approval for use in control of mites on cotton as well as certain ornamentals and nonbearing citrus. Chemically, 2,3 - p - dioxanedithion - bis - (O - O-diethyl phosphorodithioate). In early stages was called "Navadel."

Detamide—Cowles Chemical Co., Cleveland, O. Tradename for formulation of diethyltoluamide insect repellent.

Diazinon—Geigy Agricultural Chemicals, Ardsley, N. Y. Insecticide particularly effective for fly control, roaches, silver fish, and ants.

Dibrom—California Spray Chemical Corp., Richmond, Calif. An organic phosphate insecticide designed for dilute or concentrate application for control of various insect pests. Offered in limited quantities and on a limited basis. Chemically O,O-dimethyl-O- (1,2-dibrome - 2,2 - dichloroethyl) phosphate.

Dicapthon—American Cynamid Co., New York. Pesticide for roach control,—known formerly as #4124. Chemically, 0 - 2 - chloro,4, nitrophenyl O,O dimethyl phosphorothioate.

Dimethoate—A new experimental parasiticide not yet available to livestock raisers. General use not yet recommended.

Dinoben—AmChem Products, Inc., Ambler, Pa. New herbicide known during experimental work as ACP M-460, for pre-emergence control of weeds. Chemically, 2,5-dichloro-3-nitrobenzoic acid.

Dorlone—Dow Chemical Co., Midland, Mich. Soil fumigant.

Dow Herbicide—Dow Chemical Co., Midland, Mich. A new pre-emergence herbicide under investigation by Dow Chemical research laboratories, which may prove effective for control of weeds in farm crops and crab grass in turf. Product is not yet named.

Dowicide "A"—Dow Chemical Co., Midland, Mich. Fungicide suggested for citrus fruit and apples, pears and other fruit. Chemically, sodium orthophenylphenate.

Dri-Die—W. R. Grace, Baltimore, Md. A treated silica aerogel insecticide effective in control of roaches and termites.

Dybar—E. I. du Pont de Nemours Co., Wilmington, Del. New trade name for fenuron weed and brush killers.

Dylox—Chemagro Corp., New York. Trade name for Dipterex, insecticide for resistant houseflies and roaches. Chemically, dimethyl 2,2,2, trichloro 1-hydroxyethyl phosphonate.

Dyrene — Chemagro Corporation, New York. A foliage fungicide developed by Ethyl Corporation and Pittsburgh Coke and Chemical Co. Manufactured under license by Chemagro Corp. Product was known formerly as Kematic or B-622. Reported highly effective in control of early and late blight disease on tomatoes and potatoes. Chemically, 2,4 - dichloro - 6 - (O - Chloroanilino) triazine.

Emmi—Velsicol Chemical Corp., Chicago. Mercurial used as an eradicant and protectant. Chemically, N-ethylmercuri -1,2,3,6-tetrahydro-3,6-endomethano-3,4,4,5,7,7, -hexachlorophthalimide. Label registration for control of smut on wheat, oats, rye and seedling blight or seed decay of flax.

Emid—AmChem Products Inc., Ambler, Pa. Experimental herbicide, based on 2,4-dichlorophenoxy acetamide.

Eptam—Stauffer Chemical Co., New York. A new pre-emergence selective herbicide, offered experimentally for further research and evaluation. Chemically, ethyl di-N-propylthiolcarbamate (EPTC).

Ethion—Niagara Chemical Division FMC, Middleport, N. Y. An organic phosphate insecticide- miticide, currently registered for use on cotton, seed alfalfa, and seed ladino clover. Chemically, O,O,O;O;-tetraethyl S,S-methylene bis phosphorodithioate.

Fenac—AmChem Products, Inc., Ambler, Pa. Herbicide for pre-emergence control of crabgrass. Formulation of 2,3,6-trichlorophenylacetic acid.

Forron—Dow Chemical Co., Midland Mich. Herbicide.

Glyodin—Union Carbide and Carbon Corp., New York. Fruit fungicide which has been on the market for several years. Product is a liquid solution of o-heptadecyl glyoxalidin acetate in isopropanol.

Glyoxide—Corona Chemical Div., Pittsburgh Plate Glass Co., Pittsburgh, Pa., a new high-finish fungicide formulation for control of fruit growing diseases.

Guthion—Chemagro Corp., New York. An insecticide-miticide developed by Farbenfabriken Bayer A.G. of Leverkusen, Germany. Commercial production begun April, 1958. Chemically, O-O-dimethyl S- (4-oxo-1,2,3,-benzotriazinyl-3-methyl) phosphorodithioate.

To be Concluded in March

INDEX to ADVERTISERS

Allied Chemical Corporation—Nitrogen Division 89-92
American Agricultural Chemical Co. 20
American Cyanamid Co. 22
American Potash & Chemical Corp. .... 2nd Cover
Antara Chemical Div., General Aniline & Film Corp. 96
Ashcraft-Wilkinson Co. .... Dec.

Bagpak Div., International Paper Co. .... 2nd Cover
Baughman Manufacturing Company 121
Bemis Bros. Bag Co. 116
Berkshire Chemicals, Inc. .... Jan.
Bradley Pulverizer Co. 18
Buffalo Meter Co. .... Dec.

Call Air 66
Chase Bag Co. 4
Chemical Construction Corp. 44
Chemical Insecticide Corp. .... Dec.
Clark Equipment Co. .... Jan.
R. D. Cole Mfg. Co. .... Dec.
Combustion Engineering, Inc. Raymond Division .... Jan.
Commercial Solvents Corp. 8
Continental Can Co., Flexible Packaging Div. .... Dec.
Cox, Dr. Alvin .... Jan.

Davies Nitrate Co. .... Jan.
Davison Chemical Co., Division of W. R. Grace & Co. 78
Dorr-Oliver Co. 46
Du Pont de Nemours & Co. .... Dec.
Duval Sulphur & Potash Co. .... Dec.

Eastern States Petroleum & Chemical Corp. 21
Emulsol Chemical Corp. .... Dec.
Escambia Chemical Corp. 124

Fairfield Chemical Div., Food Machinery & Chemical Co. 7
Flexo Products, Inc. 124
Fry Co., Geo. H. 127

Glenn Chemical Corp. 114
Geigy Agricultural Chemicals 88
General Reduction Company 117
Glendon Pyrophyllite Co. 123
Glenn Chemical Co. 114
Great Lakes Chemical Corp. 97
Greeff & Co., R. W. 126
Grinnell Co. .... Jan.

Hahn, Inc. 58
Hercules Powder Co. .... 4th Cover
Hi-Shear Rivet Tool Co. 56
Hooker Chemical Corp. 118
Huber, J. M. Corp. 119
Hudson Pulp & Paper Co. 94

International Minerals & Chemical Corp. 69-72

Johns-Manville Co. .... 3rd Cover

Kellett Aircraft Corp. .... Jan.
Kennedy Van Saun Mfg. & Eng. Corp. 120
KLM Royal Dutch Airlines 128
Kolker Chemical Corp. 95
Kraft Bag Co. 17

Magnet Cove Barium Co. 86
Monsanto Chemical Co. .... Jan.
F. E. Myers & Bros. Co. 62

National Potash Co. 92
Nitrogen Division-Allied Chemical Corp. 81-84

Olin Mathieson Chemical Corp. 102-103

S. B. Penick & Co. 74
Piper Aircraft Corp. 54
Phelps Dodge Refining Corp. 48
Phillips Chemical Co. 112
Potash Company of America 3
Prentiss Drug & Chemical Co. 76

Randolph Products Co. 58
Raymond Division, Combustion Engineering, Inc. .... Jan.
Republic Steel Corp. 126
Reideburg, Theodore Associates 129
Renneburg & Sons Co., Edw. .... Jan.
Richardson Scale Co. .... Dec.
Rohm & Haas Co. 19

Scientific Associates, Inc. 124
Snell, Foster D., Inc. 129
Shell Chemical Corp. 16
Southeastern Clay Co. .... Jan.
Southwest Potash Corp. 6
Spencer Chemical Co. 12, 13
Sperling Laboratories 129
Spraying Systems Inc. .... Jan.
Standard Oil Co. (Indiana) 10
Stauffer Chemical Co. 67
Stepan Chemical Co. .... Jan.
St. Regis Paper Co. 106, 107
Sturtevant Mill Corp. 109
Summit Mining Corp. .... Dec.
Swift & Co. 14

Tennessee Corp. 15
Texas Co. .... Dec.
Texas Gulf Sulphur Co. 90
Thayer Scale Co. .... Dec.
Townsend, Dr. G. R. 129
Transland Aircraft 56
Thos Alabama Kaolin Co. 113

Union Bag-Camp Paper Co. 110
Union Carbide Chemical Co. .... Dec.
United-Heckathorn 101
U. S. Industrial Chemical Co. .... Jan.
U. S. Phosphoric Products, Div. Tennessee Corp. 98, 99
U. S. Potash Co. 11

Vanderbilt Co., R. T. 115
Velsicol Chemical Corp. 43
Victor Chemical Corp. 51, 52

West Virginia Pulp & Paper Co. 122
Wilson & Geo. Meyer Co. .... Dec.
Wisconsin Alumni Research Foundation 126
Dr. Wolf's Agricultural Labs. 129
Woodward & Dickerson, Inc. .... Jan.

Young Machinery Co. 125

TALE ENDS

RECENTLY in skimming through a dusty biographical directory of McHenry county, Illinois, published in 1877, one of our readers ran across the following advice to farmers on how to use dust on cattle for control of common pests. The item was headed "The Value of a Dust Bath for Animals." It stated:

"The almost indispensable necessity of an ample supply of dust for animals in winter is understood by few stock growers. All sorts of animals delight in a dust bath . . . . . Cattle delight to stand in a dusty road, scraping it up with their forefeet and flinging it over their backs. The cheapest and most effective cure for lice on cattle is to scatter a quart of perfectly dry dust along the spine, from the horns to the tail.

When we read these current suggestions about use of non-toxic dusts for pest control, we begin to wonder just how much progress there has actually been in the past hundred years, —or how well the developers of today's highly efficient new pesticides have succeeded in getting their story across to the end user. Not well enough, we fear.

AC

New techniques in the application of anhydrous ammonia to the soil are being sought by agricultural engineers. The Texas Company, leading producer of anhydrous ammonia, recently set up a $3,500 research grant to finance a study of new machines and application methods. What they hope to find is a way to apply nitrogen to the corn rows at plowing time. This would save one complete field operation, eliminating the custom application cost which is in the neighborhood of two dollars an acre.

AC

Naugatuck has lost the latest round in its long battle in defense of the use of Aramite on edible crops. It will be recalled that a couple years back when the Food and Drug Administration first began talking in terms of a zero tolerance of Aramite residues on edibles, the producer successfully petitioned to have the first review board set up to advise FDA. It was following their report that a tolerance of 1 ppm was established, and further study of the subject was recommended. That further study has now indicated to Food and Drug the desirability of returning to zero tolerance. Full details on page 89.

AC

A further extensive airing of the pesticide-wildlife controversy may be expected at two sessions in New York in late February and early March. Panels at the National Wildlife Federation Conference, February 27-28, and the North American Wildlife Conference, March 2-4, Hotel Staler, will give pro and con views on the subject and seek to determine whether, on balance, the area spray programs which the USDA has been conducting have done enough good to justify their continuance;—whether, in the final analysis, it makes better sense to try to get rid of some of our troublesome insect pests permanently rather than to attempt to live with them.

AC

As salesmen registered for a sales meeting in Skokie Ill., in the "second stage" of IMC's Full Orbit customer service program,—they were checked for space flight fitness by an appropriately garbed "space nurse." International Minerals and Chemical Corp. last month launched the first in the series of nine regional training meetings for 350 salesmen, representing 156 fertilizer companies.

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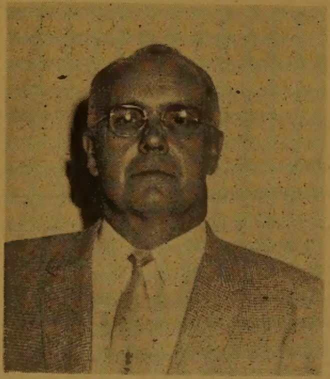

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New York, New York

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The Cooperative Grange League Federation Exchange, of which Edward H. Phillips is Director of Purchasing for the Soil Building Division, operates four feed mills, 14 insecticide and fertilizer plants, eight seed processing plants, nine marine and two pipeline terminals for petroleum products, and eight wholesale farm supply warehouses. Also, it operates more than 625 retail outlets — 240 owned by the GLF and the remainder owned and controlled by local farmer co-ops or agent buyers in the areas served. GLF lists some 118,000 farmer members in New York, New Jersey, and the northern tier counties of Pennsylvania.

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